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NATIONAL COMMUNICATIONS FROM PARTIES NOT INCLUDED IN ANNEX I TO THE CONVENTION

THIRD COMPILATION AND SYNTHESIS OF INITIAL NATIONAL COMMUNICATIONS FROM PARTIES NOT INCLUDED IN ANNEX I TO THE CONVENTION

Addendum

Note by the secretariat

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Explanatory notes

The following ISO* country codes have been used throughout this document:

Algeria	DZA	Honduras	HND	Niger	NER
Argentina	ARG	Indonesia	IDN	Philippines	PHL
Armenia	ARM	Israel	ISR	Republic of Korea	KOR
Azerbaijan	AZE	Jamaica	JAM	Republic of Moldova	MDA
Bhutan	BTN	Jordan	JOR	Saint Vincent and the Grenadines	VCT
Bolivia	BOL	Kazakhstan	KAZ	Samoa	WSM
Cape Verde	CPV	Kiribati	KIR	Senegal	SEN
Chile	CHL	Lao People's Democratic Republic	LAO	Seychelles	SYC
Cook Islands	COK	Lebanon	LBN	Singapore	SGP
Costa Rica	CRI	Lesotho	LSO	Sri Lanka	LKA
Côte d'Ivoire	CIV	Malaysia	MYS	Thailand	THA
Democratic Republic of the Congo	COD	Mali	MLI	Turkmenistan	TKM
Ecuador	ECU	Marshall Islands	MHL	Tuvalu	TUV
Egypt	EGY	Mauritius	MUS	Uruguay	URY
El Salvador	SLV	Mexico	MEX	Uzbekistan	UZB
Georgia	GEO	Micronesia (Federated States of)	FSM	Vanuatu	VUT
Ghana	GHA	Nauru	NRU	Zimbabwe	ZWE
Grenada	GRD				

* International Organization for Standardization

I. INTRODUCTION

1. Pursuant to Articles 4.1 and 12.1 of the United Nations Framework Convention on Climate Change, all Parties to the Convention shall communicate information to the Conference of the Parties (COP). This provision includes Parties that are not listed in Annex I to the Convention, referred to below as Parties. Article 12.5 specifies that each non-Annex I Party shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4.3. Parties that are least developed countries may make their initial communication at their discretion.

2. By its decision 3/CP.6, the COP requested the secretariat, *inter alia*, to prepare the third compilation and synthesis of initial national communications from Parties not included in Annex I to the Convention (non-Annex I Parties), based on submissions received from such Parties by 1 June 2001, and to make that report available to the subsidiary bodies for consideration by the Conference of the Parties at its seventh session.

3. The organization of information in this report uses a structure which was developed on the basis of the UNFCCC guidelines, annexed to decision 10/CP.2, and is meant to facilitate the compilation and synthesis of information. Parties may wish to organize future presentation of information in their national communications along these lines. The secretariat will take account of the views expressed by Parties on the structure of this report and make modifications as appropriate when preparing subsequent compilation and synthesis reports.

4. As part of the compilation and synthesis, the secretariat was also requested to report on constraints and problems encountered in using the UNFCCC guidelines for the preparation of initial national communications by non-Annex I Parties, and on other issues raised by non-Annex I Parties, with a view, among other things, to enhancing further the comparability and focus of the communications. The secretariat noted that Parties, while using the UNFCCC guidelines for the communication of information, provided varying degrees of detail under the various headings and sub-headings into which the guidelines are currently organized. In some instances, the information relevant to a particular section of the guidelines was not readily accessible due either to its dispersion throughout the text or to an interpretation of a sub-heading which led to its inclusion under a different section of the communication.

5. Information provided in this document could also serve in supporting the implementation of other COP decisions, particularly those on other matters relating to communications from Parties not included in Annex I to the Convention, on capacity-building in developing countries and on the implementation of Article 4, paragraphs 8 and 9 of the Convention.

6. The third compilation and synthesis of initial national communications from non-Annex I Parties covers 52 Parties which submitted their initial communications by 1 June 2001.[1]

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[1] In addition, Argentina, Jordan and Uruguay submitted updates to their communications or updated parts of their communications, such as their national GHG emission inventories.

II. NATIONAL CIRCUMSTANCES

7. All reporting Parties provided information on national circumstances in varying levels of detail. The information was not limited exclusively to the national circumstances section of the communication but in some cases appeared also in other sections.

8. Parties provided information on their countries' geography, climate and economic background, as well as development priorities, objectives and circumstances. Thus information on national circumstances provides the basis for understanding a country's vulnerability, and its capacity and options for adapting to the adverse effects of climate change, as well as its options for addressing its GHG emissions within the broader context of sustainable development.

9. Parties which have submitted their communications vary greatly in size and population, ranging from the world's eighth largest country in area (ARG), and its fourth most-populated country (IDN), to the world's smallest and least populated countries (NRU, TUV). Forty-five reporting Parties are covered by the 2001 Human Development Report of the United Nations Development Programme (UNDP), which places seven of them in the "High Human Development" category, 28 in the "Medium Human Development" category and seven in the "Low Human Development" category. Of the Parties that have submitted their national communications, 12 are classified by the United Nations as least developed countries.

A. Basic information

Physical geography

10. Parties reported, in varying detail, information regarding their climatic and geographical conditions, and their biological diversity, as well as on how climate change would influence these conditions. Some countries reported their percentage of land covered by different ecosystems or types of land use, while others characterized their geographical subdivisions by type of climate.

11. Communications were submitted by, *inter alia*, small island developing States, peninsular, landlocked and nearly landlocked countries. Seventeen reporting Parties mentioned having arid and semi-arid regions. Forty Parties are located in the tropics, while 12 are located in the temperate zones. Thirty-seven Parties have mountainous regions and 10 have indicated that they have active volcanoes. Some Parties also reported that they have regions with some of the highest biodiversity in the world.

Climate

12. Climatic variables such as mean annual temperature, rainfall and humidity were reported by most Parties. Others provided information on insolation, wind velocity, exposure to tropical cyclones, the intensity and frequency of the incidence of the El Niño-Southern Oscillation (ENSO) phenomenon and hydrological characteristics. Most countries also noted the influence of the regional climate regime (rainfall and temperature) on their environments.

Economy

13. All Parties included information on their basic economic and social settings. Some Parties mentioned that their service sectors contributed 50 per cent or more to their total GDP. In other countries the industrial sector contributed significantly to the gross domestic product (GDP), for example 72 per cent in the Republic of Korea, 36 per cent in Turkmenistan, 32 per cent in Malaysia, 28 per cent in Algeria and 25 per cent in Ghana. Most of the reporting Parties provided information on the evolution of their economies, including developments relating to globalization, deregulation, privatization and currency convertibility. Some Parties also indicated a decline in the energy intensity of production.

14. Reporting Parties provided information on their demography which indicated that a significant proportion of their populations live in urban areas. In some Parties, the percentage of the population residing in urban areas may be as high as 50 per cent of the national total.

B. Sectoral compilation and synthesis of development priorities, objectives and circumstances

Agriculture and food security

15. All Parties stressed that the development of agriculture is a development priority. Agriculture's share of GDP ranged from 0.8 per cent for the Federated States of Micronesia to 56.4 per cent for the Lao People's Democratic Republic. Similarly, the share of agricultural area as a percentage of total land area varied widely, ranging from 0.6 per cent for Jordan to 82 per cent for Turkmenistan. The percentage of the labour force engaged in agricultural and related food processing and transportation activities also varied widely, with Tuvalu reporting a value as high as 72 per cent.

16. Parties often presented statistical data on the agricultural sector in tabular form. This was structured in a disparate manner across the communications but generally incorporated data on main crops or categories of agricultural land use. Parties also provided information on their agricultural practices, such as crop rotation, and on their efforts to reduce government intervention in the agricultural sector while ensuring food security. Many Parties mentioned that subsistence agriculture was the main form of agricultural activity.

17. Egypt and the Marshall Islands stressed their reliance on imported food products to ensure food security, and project that the situation would be aggravated by climate change. Azerbaijan and the Republic of Moldova reported that the agricultural sector was undergoing difficulties, with state-owned farms being transferred to private ownership, while both agricultural produce and their cultivated areas had been decreasing rapidly due to a lack of financial resources for the purchase of fertilizers and machinery. Saint Vincent and the Grenadines mentioned that the fall in banana prices and unfavourable weather conditions experienced during 1990 to 1995 resulted in an 87 per cent reduction of revenues from banana exports, while Argentina reported a significant increase in its agricultural productivity as a result of the adoption of modern technology in this sector. Israel reported that it has a scientifically well-developed agriculture sector which is able to produce good quality and high-yielding crops.

18. A number of Parties mentioned artisanal and/or commercial fishing as an important economic activity. A few of them characterized the fishing sector as a high-priority economic sector and expressed concern about declining fish stocks, the destruction of fish habitats and the occurrence of coastal pollution. The Federated States of Micronesia indicated that the ENSO had limited the development of its tuna industry.

19. Many Parties provided data on their livestock production which covered cattle, poultry, pigs, sheep, goats, horses and camels. Argentina provided such data for the period 1993 to1996, demonstrating a decreasing trend in the numbers of its population of cattle, sheep and goats over this period, while the Republic of Korea noted an increasing population of cattle, chickens and pigs. Senegal mentioned that frequent drought conditions had led to a decline in cattle population since independence (1960). The Seychelles reported self-sufficiency in the production of poultry meat, eggs and pork.

20. Kazakhstan characterized sheep breeding as its most important agricultural activity, while Mali, Niger and Uruguay described livestock breeding as a traditional pillar of their economies. Senegal indicated that poultry production contributed 7.3 per cent of GDP. The Federated States of Micronesia mentioned a growing importance of pig and poultry production.

Energy

21. Most Parties provided detailed information on resources, policy and institutions in the energy sector, while others classified end-use consumption on the basis of energy carriers such as electricity and heat.

22. Argentina indicated that an increase in national demand for energy was due to increases in energy consumption in the residential and services sectors. Egypt attributed the increase in its energy demand to the process of industrialization, coupled with an increase in energy intensity of production. Thailand stated that the economic boom during the period 1990 to 1997 resulted in an increase in energy consumption of about 8.9 per cent annually.

23. Estimated reserves of fossil fuels and/or non-fossil fuel energy sources were presented by many Parties. These included quantitative comparisons between total reserves over time or qualitative assessments of the sufficiency of the reserves to meet current and projected energy needs. Many reporting Parties mentioned that they relied heavily on fossil fuel imports to meet their energy needs, in addition to using their indigenous energy sources such as biomass. Some countries are net exporters of fossil fuels, with the value of these exports ranging from 20 per cent to 67 per cent of the country's total exports.

24. Reporting Parties provided information on alternative energy resources and mentioned that these include photovoltaic, solar thermal, wind, hydroelectric, geothermal, oil shale, and biomass energy. Some Parties mentioned the existence of significant hydroelectric power generation in their countries. Egypt indicated that the share of its hydroelectric power in proportion to total energy requirements has been dropping sharply over time. Georgia mentioned that, due to poor maintenance, hydroelectric plants produced energy at 60 per cent of their full capacity and that total energy loss in the power network had reached 25 per cent of total power generated.

25. Information provided by Parties on their efforts aimed at harnessing solar and wind energy was scanty. A number of Parties reported that favourable circumstances do exist for future exploitation of such renewable resources. Two Parties reported significant geothermal resources. Georgia reported that the current potential, if exploited, could satisfy the hot water and heating requirements of approximately 28 per cent of its population.

26. Several Parties described the evolution of energy consumption patterns over a number of years up to 1996. Others gave detailed statistics on energy output and consumption, and the share of imports, exports and/or the production of fossil fuels. Some Parties presented projections of future energy demand and/or supply. Annual growth rates ranged from 4 per cent to 6.9 per cent for the period leading up to the year 2010.

27. A number of Parties provided information on the trend in the energy mix used in their countries and described their initiatives to move away from high carbon content fuels, such as oil and gas, to natural gas and renewable energy sources. Some communications also included information classifying energy consumption by sector. A small number of Parties indicated that the residential sector accounted for a substantial amount of total energy, e.g. 88 per cent for Lesotho, and 49.5 per cent for Algeria.

Forests

28. Most Parties included information on forest resources under sections dedicated to forest resources, land use, farming or natural vegetation. Data were provided on the size of the forested area or the share of forests in total land area. Sizes ranged from about 12,000 ha in Saint Vincent and the Grenadines to over 100 million ha in the Democratic Republic of the Congo. Some Parties also provided data on their timber production. Information was also provided on forest species, densities and management practices. Côte d'Ivoire indicated that its forests contained about 600 tree species.

29. Information on forests and forestry lands were provided by some Parties (BTN, CIV, COD, JAM, LAO). Côte d'Ivoire indicated that it had a total of 169 protected forests, while the Democratic Republic of the Congo provided information on its forest management practices, which covered: reforestation, exploitation rules, conservation practice, protected areas, territorial land, national parks, reserves, botanic and zoological gardens, and hunting reserves.

30. The main concerns pointed out by the Parties include the deleterious impacts of climate change on forests and forest resources (BTN), pressure on forest resources, high deforestation rate, difficulties in establishing reserves, national parks, protected forests (BOL, BTN, CIV, CRI, HND, KOR, LAO, LKA). Jamaica stressed difficulties in estimating and monitoring deforestation rates, high usage of charcoal and fuel wood and lack of information on biomass.

Mining

31. Some Parties (CHL, DZA, EGY, GHA, JOR, KAZ, NRU, ZWE) mentioned mining as an important economic sector. Zimbabwe stated that in 1994 the mining of resources, which included gold, copper, chromium, iron, platinum and emeralds, contributed 6 per cent to the country's GDP. In Ghana the mining and quarrying sector contributed 5.6 per cent of GDP in 1996. Jordan indicated that mining-based exports were a primary source of foreign exchange

earnings, and that in 1995 the mining and quarrying sector became the leading contributor to the country's GDP. Kazakhstan mentioned that its industry was dominated by mining and mineral processing activities geared toward exploiting the natural resource base, which included coal, iron, chrome and phosphorites.

Tourism

32. Some Parties highlighted tourism as a priority economic sector. The Cook Islands mentioned the share of tourism revenues to be as high as 37 per cent of GDP. Mauritius mentioned that tourism earnings represented 15 per cent of foreign exchange earnings. Parties also expressed an expectation that the tourist industry would continue to grow in the future, and indicated the need for more investment in tourism infrastructure.

Transport

33. Many Parties provided information on their transport sector. Some of these provided statistical information on their commercial and private vehicle fleet, as well as their marine, riparian, railway and aviation transport subsectors. The Seychelles reported that its transport sector is the largest consumer of petroleum products, second only to electricity generation.

34. Certain trends in the transport sector were identified by a few number of Parties. These trends include the increase in road transport, at the expense of both commuter and freight railway use and maritime and railroad transport. The use of higher payload commercial vehicles was also identified.

35. Problems relating to efficiency in the transport sector included the lack of organized transport systems in most cities, in addition to an ageing car fleet, with a mean age of 13 years per vehicle in Senegal and 17.7 years in Algeria. Egypt mentioned that it had a large percentage of unpaved roads.

Water resources

36. Many Parties included information describing their water resources in their national circumstances section. Some Parties provided background information on their country's water resources in the section on vulnerability.

37. Mexico provided data on the current consumption of water and projected a significant increase in demand for water used for hydroelectric power generation and cooling of thermal power plants. Problems associated with water resources included: water distribution where most of the country's water resources are concentrated in a certain part of the country (e.g. MEX, MDA); high leakage rates of 50 to 70 per cent (COK); the shortage of groundwater (KIR, TUV); recycled drainage and waste-water a serious source of pollution (UZB); dependence on one river for all water needs, including hydroelectric power generation (EGY); dependence on one desalination plant for most of the country's clean water and the high permeability of the country's rocks (NRU, WSM).

38. Some communications provided separate data on water resources for each of the country's different regions including rainwater, rivers and/or groundwater. Malaysia provided

data on water demand projections for a period up to 2020. Kiribati indicated that the water supply for its population in some regions falls short of the World Health Organization's standard of 50 litres per person per day. The Cook Islands and Kiribati reported that complete data on their water resources were unavailable. They attributed this to a lack of human and institutional capacity.

Other sectors

39. In addition to the above-mentioned priority sectors, some Parties mentioned their marine resources - other than fisheries - as important, including coral reef preservation and/or pearl cultivation. Nauru indicated that its once relatively rich marine biota is now estimated to have declined by 40 per cent due to the run-off of fresh water from its central plateau, which has a high silt and phosphate content, and the extensive deforestation carried out prior to the phosphate mining. The Federated States of Micronesia identified the preservation of cultural and historical resources as priority areas. Egypt and El Salvador mentioned problems relating to waste management as a pressing issue in need of urgent remedial action. The Philippines provided information on its health situation, indicating the occurrence of diseases arising from poor sanitation and unsafe water supplies, such as cholera, typhoid and intestinal parasitism, and others that may be exacerbated due to climate change, such as malaria and dengue.

III. SUSTAINABLE DEVELOPMENT AND THE INTEGRATION OF CLIMATE CHANGE CONCERNS INTO MEDIUM- AND LONG-TERM PLANNING

40. Reporting Parties provided information in varying detail on sustainable development programmes and integration of climate change concerns into long-term national planning under different sections of the communications. Four Parties (GHA, MYS, PHL, THA) dedicated a section of their communications to strategies for sustainable development, while eight others included a section on national planning. Twelve Parties had a section on their institutional structure to implement the Convention. Other reporting Parties provided information on sustainable development and planning activities when describing national development or environmental plans, institutional arrangements (such as governmental institutions dedicated to the implementation of environmental and development priorities) and national legislation on the environment and/or development.

41. In describing their concerns relating to sustainable development, 18 Parties emphasized the need to ensure an integrated approach in dealing with environmental issues. Six Parties (LBN, LSO, MEX, PHL, SEN, ZWE) presented detailed information regarding sustainable development activities and priorities initiated within the framework of implementing Agenda 21 while five Parties (FSM, GHA, MLI, SEN, URY) mentioned the creation of sustainable development or global change committees.

42. Parties also described activities that national environmental or development plans should incorporate in order to achieve sustainable development. These included the protection of natural resources by assessing environmental impacts; conservation of soils, water resources, forests and biodiversity; protection of coral reefs and the combating of desertification; and improvement of waste management, pollution control and land-use planning. Others include integrating economic incentives and tools in environmental policies, and enhancing public

awareness and the participation of non-governmental organizations and the private sector in the implementation of measures.

43. Fifteen reporting Parties indicated that they are in the process of formulating comprehensive national climate change plans and policy frameworks to coordinate and facilitate the implementation of the UNFCCC. Twenty-six other Parties stressed that climate change planning would be taken into account in future social, economic and environmental considerations in accordance with national development priorities. They mentioned climate change planning under other related plans, such as those on nature conservation (LSO, ZWE), energy conservation (13 Parties) and the environment (15 Parties).

44. Twenty-seven Parties reported on the need for capacity-building activities to facilitate the implementation of adaptation and mitigation options identified in their national communications. They also stressed the need for improved capacity to identify national priorities and develop sectoral strategies and measures. These included specific needs in the areas of integrated coastal zone management (COK, HND, KIR, LBN, MLI, MUS, SYC), water resources (BOL, GHA, HND, MUS, SLV, SYC, TKM), agriculture (ECU, GEO, HND, LAO, NER, VUT), integrated energy plans (ARG, PHL, SLV, URY), promotion of climate change technology (CPV, ECU, GHA, JAM, MEX, THA), and waste management (MUS).

45. Several Parties mentioned the creation of specific institutional frameworks dedicated to climate change. These included inter-ministerial climate change coordination committees, technical working groups undertaking specific studies on inventories, mitigation, vulnerability and adaptation, and climate research centres coordinating national studies. Three Parties (FSM, LBN, MEX) reported that there is a need to improve capacity for developing a framework for activities dedicated exclusively to climate change and called attention to difficulties relating to coordination and division of labour among national agencies. Twenty-nine Parties also provided information on institutional strengthening initiatives essential for effective implementation of climate change activities.

46. Efforts to coordinate climate change activities were highlighted by 22 Parties. Fourteen national communications stressed the importance of the role of national UNFCCC focal points or national authorities designated to coordinate climate change activities; others included information on specific coordination activities, such as coordinating meetings (URY), the integration of databases (DZA, LBN) or the development of information and networking (UZB). The need to strengthen their capacities to coordinate climate change activities was identified at local (FSM, HND, LSO, SLV, SYC, TKM), national (DZA, ECU, HND, JAM, LAO, MLI, NER, SLV, SYC, TKM, URY, ZWE) and regional levels (JAM, MEX, URY), and in both the private and public sectors (SYC, URY, VCT).

47. Some Parties emphasized the importance of sustaining the activities initiated under the preparation of their initial national communications. These include capacity-building for human resources and infrastructure for undertaking the collection, management and monitoring of data and continuity of national teams constituted for the preparation of the national communications.

48. Thirty-two Parties mentioned the relevance of effective participation of stakeholders, including non-governmental organizations, the private sector, academia and local community-

based organizations, in the development of climate policy and for ensuring continuity of climate change activities during the preparation of national communications.

49. Nineteen Parties emphasized that one of the ways of integrating national climate change into planning is through the development and enhancement of appropriate legislation. Five Parties (ARG, AZE, GEO, LBN, ZWE) stressed the need to improve capacity for developing climate change legislation, while other Parties provided information on national environmental or energy-saving regulations of relevance to climate change. Twenty-three Parties reported on existing and planned environmental legislation while 13 Parties reported that they have developed forestry laws. Energy conservation legislation or strategies were mentioned by 19 Parties. Several Parties also made mention of strategies or legislation to foster the use of renewable energy sources, while Mexico indicated that it has amended its clean air legislation with a view to regulating carbon dioxide emissions.

IV. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS OF GREENHOUSE GASES

50. In accordance with Articles 4.1 (a) and 12.1 (a) of the UNFCCC, reporting Parties communicated a national inventory[2] of anthropogenic emissions by sources and removal by sinks of greenhouse gases not controlled by the Montreal Protocol. This section of the report covers inventory information and methodological and analytical issues and problems identified by 52 out of 146 non-Annex I Parties. Hence, conclusions on common patterns of the reporting of inventory data may not be applicable to all non-Annex I Parties. The information provided here may, however, be useful for Parties in the process of preparing their national inventories of greenhouse gases.

A. Methodological issues

51. Most Parties followed the UNFCCC guidelines and took into account relevant SBSTA conclusions contained in document FCCC/SBSTA/1996/20 paragraphs 30(b) and 31 when reporting on their GHG inventory data.

Methods and gases

52. All Parties followed the IPCC Guidelines in compiling their national GHG inventories, and 41 of them used the Revised 1996 IPCC Guidelines. Generally, Parties used IPCC default methods, but some developed their own methodologies and emission factors for specific sectors. All Parties presented emissions estimates for the three main gases, CO_2, CH_4 and N_2O, on a gas-by-gas basis. Forty-five Parties provided emissions data for all or some ozone precursors (CO, NO_x and NMVOC). All Parties reported on CO_2 emissions and removals from the land-use change and forestry sector, except five countries (FSM, KIR, MHL, SGP, TUV). Although not required by the UNFCCC guidelines, 36 Parties provided estimates of aggregate GHG emissions in terms of CO_2 equivalent using the IPCC global warming potential values. Table 1 summarizes the status of reporting of inventory data by Parties.

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[2] The national communication of the Marshall Islands contains a chapter on the national GHG inventory, but no inventory data were provided.

53. The degree of completeness in reporting on IPCC sectors and subsectors was high. Most Parties reported the most significant GHG emission source and sink categories, such as CO_2 emissions from fuel combustion and industrial processes, CO_2 removals from land-use change and forestry, CH_4 emissions from agriculture and waste, and N_2O from agricultural soils and fuel combustion.

54. The completeness of reporting of the 39 Parties that are not small island developing States is approximately the same as that of Annex I Parties (table 2). The reporting in most IPCC source categories is more comprehensive than as identified in table 3, which includes all reporting Parties.

55. The level of reporting of small island developing States, some of which belong to the category of least developed countries, was less complete than that of other non-Annex I Parties.[3] This may be a reflection of the structures of the economies of these countries. It has to be noted also that the overall GHG emissions of these countries are relatively low, even when they are compared with other non-Annex I Parties. The 15 small island States represent 29 per cent of the 52 non-Annex I Parties included in this compilation, but their emissions account for only 5.9 per cent of the total.

56. Only two Parties reported on fully fluorinated compounds, such as PFCs (DZA) and SF_6 (LKA), as encouraged by the UNFCCC guidelines. Four Parties (BOL, CRI, DZA, LBN) reported emissions of hydrofluorocarbons (HFCs),[4] which is not requested by the UNFCCC guidelines but is encouraged by the SBSTA. The lack of reporting on these gases may be explained by the possible non-existence of such emissions or by the fact that these emissions were not estimated.[5]

57. Estimates of emissions from international aviation and marine bunker fuels were reported by 28 Parties. In conformity with the IPCC Guidelines, these emissions were not included in the national total but were reported separately. Fourteen Parties provided a breakdown into marine and aviation bunkers.

58. The UNFCCC guidelines request Parties to make efforts to report the estimated range of uncertainty of their emission estimates, where appropriate. The reporting of uncertainties was limited. Only 18 Parties complied with this request, seven of them providing the information quantitatively, and the other 11 qualitatively. For estimates from the energy sector, generally high confidence levels were reported, while for the land-use change and forestry sector confidence levels ranged from medium to low (table 4).[6]

Reporting tables

59. All Parties reported their inventories in accordance with the UNFCCC guidelines. Most of them provided more information than the minimum requested and used more comprehensive

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[3] It should be noted that some small Annex I Parties, such as Monaco or Liechtenstein, provided less complete reporting of GHG emissions and removals than other Annex I Parties due to the specific structure of their economies.

[4] Argentina also reported HFCs from its inventory for 1997.

[5] It has to be noted that the IPCC Guidelines did not provide methods for estimating emissions of these GHGs until the 1996 version which was available only from mid-1997.

[6] For confidence levels reported by Annex I Parties, see document FCCC/SBSTA/1998/7, table 14.

tabular formats than that of table II of the UNFCCC guidelines (table 5). All Parties followed the IPCC Guidelines for estimating their GHG emissions: 40 reporting Parties used the IPCC summary[7] or provided information in a similar format, and 11 Parties presented their inventories using table II of the UNFCCC guidelines; however, six of them included sectors or source categories other than those explicitly required by that table.

60. The use of the IPCC summary tables provides for a more disaggregated reporting of GHG inventory data than requested for in table II of the annex to the UNFCCC guidelines. Reporting of GHG emissions from a number of different IPCC source categories is not explicitly requested in this latter table, but may be included under "other". This is particularly the case for some significant source categories, such as waste and agricultural soils. They were explicitly reported by 46 and 37 Parties respectively, as shown in table 5. The relative share of GHG emissions for which no reporting is explicitly requested or which might be reported as "other" in a Party's total GHG emissions is sometimes substantial. For 51 Parties this share ranged from 1 per cent to about 70 per cent of the aggregate GHG emissions, expressed in terms of CO_2 equivalent, with an average of 26 per cent.

61. Twenty Parties also provided IPCC worksheets (table 6) which give detailed calculations for the estimation of GHG emissions as well as numerical information on aggregate emission factors and activity data for inventories using the IPCC default methods. The provision of these worksheets contributes substantially to the transparency of the inventories.

62. In addition, 23 Parties estimated their fuel combustion emissions using both the reference and the sectoral approach as requested by the IPCC Guidelines (table 6), while three Parties (CHL, EGY, LBN) mentioned that they performed the comparison but did not report the observed differences. This comparison is a useful self-verification procedure which greatly improves the transparency of the inventories. The usefulness of applying both approaches would be enhanced if the identified differences were explained by Parties. For most Parties, the differences observed were of a similar order of magnitude to those reported by Annex I Parties to make such comparisons.[8]

63. Table II of the UNFCCC guidelines requests Parties to describe assumptions and methods, and the values of emission coefficients where these differ from IPCC default methods and coefficients. This allows for a more transparent reporting of inventory information. Most Parties used the default emission factors provided in the IPCC Guidelines. However, some Parties made an effort to develop national emission factors which better reflect their national circumstances, for example in rice cultivation as reported by the Republic of Korea, or in land-use change and forestry as reported by Chile and Mexico. The Parties which provided IPCC worksheets or standard data tables included the values of the aggregated emission factors used.

64. The source of the activity data used for the emission estimates of the different sectors and source categories was referenced by many Parties, even though this information is not explicitly requested by the UNFCCC guidelines. Generally, Parties indicated that activity data were

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[7] The IPCC software provides for automated reporting of IPCC summary tables. See *Greenhouse Gas Inventory Software for the Workbook of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories - Instruction Manual*.

[8] See document FCCC/WEB/SAI/2000, pages 17-18.

obtained from national sources such as national statistics provided by the respective ministries, municipalities and agencies, or from industrial facilities. In some cases, reference to international statistics was made, for example to statistics of the Food and Agriculture Organization of the United Nations (FAO).

Main problems identified by Parties

Activity data

65. All 52 Parties identified problems in preparing their national inventories (table 7). Most of these problems relate to the lack of activity data for estimation of emissions in some sectors, or unavailability of activity data suitable for compiling the national GHG inventory in accordance with the IPCC Guidelines. Sixteen Parties reported problems relating to limitations of the current IPCC methodologies for estimation of emissions in some sectors, particularly land-use change and forestry (table 7).

66. In the LUCF and agriculture sectors, Parties reported that a number of important activity data are either lacking or are not accessible due to the lack of adequate data collection and/or management systems. Parties also reported difficulties in obtaining activity data in the necessary time series for estimating more reliable emissions in some source categories of the LUCF sector. In the energy sector, energy balances which provide relevant activity data are lacking in some countries. Activity data for energy use (for example, for biomass combustion or kerosene) are also lacking in the informal and household sectors of a number of Parties. In the industrial processes sector, Parties faced problems in collecting activity data, particularly from the private sector.

Emission factors

67. Twenty Parties reported that the default emission factors provided by the IPCC Guidelines for LUCF, agriculture, waste and fugitive methane emissions, as well as for non-CO_2 emissions from fuel combustion, often do not reflect national circumstances well and hence their use in inventory calculation increases the uncertainty of the estimates (table 7). The IPCC Guidelines, however, do encourage the development and use of national emission factors that suit national circumstances better than the use of the IPCC default emission factors.

Methodological problems encountered in the use of UNFCCC guidelines

68. The existence of the UNFCCC and the IPCC guidelines helped Parties to provide the best available data in their national GHG inventories. However, some common problems in the use of the UNFCCC guidelines were identified:

(a) Table II of the annex to the UNFCCC guidelines does not facilitate disaggregated reporting of GHG emissions by sources and removals by sinks. This table does not follow the disaggregation of the IPCC source categories in most sectors, although it provides for reporting of any kind of emissions and removals under "others". If Parties using the IPCC Guidelines wish to report all GHG emissions and removals they have estimated, they have to add several rows under "others" in table II of the UNFCCC guidelines;

(b) The UNFCCC guidelines state that Parties should use the IPCC Guidelines as appropriate and as far as possible, but do not make specific reference to the Revised 1996 IPCC Guidelines which constitute the most recent version of the guidelines. Decision 10/CP.2 was adopted by the COP before such guidelines for national GHG inventories were available to Parties. However, 41 reporting Parties used the Revised 1996 Guidelines, as encouraged by the SBSTA at its fourth session, especially those which had prepared their national communication over the last three years. All 41 Parties which submitted their inventories between 1999 and 2001 used the Revised 1996 IPCC Guidelines, except five Parties (AZE, EGY, KIR, MDA, MYS) which used the previous version of the Guidelines. Ecuador did not provide information regarding the version of the Guidelines used;

(c) The reporting of HFC emissions is not included in the UNFCCC guidelines;[9] however, a growth of HFC emissions is expected because these gases may be used as substitutes for the ozone-depleting substances that are to be phased out under the Montreal Protocol.

B. Issues relating to the preparation of inventories

Institutional arrangements

69. A description of the existing institutional arrangements for the preparation of national inventories on a continuing basis[10] was provided by many Parties. In most cases, these arrangements consist of the establishment and operation of inter-institutional committees or agencies, or teams of national experts from different sectors, both public and private, and are usually coordinated by a leading national institution or ministry. Argentina mentioned the significant contribution of a non-governmental organization to the preparation of its national GHG inventory.

Improvements

70. Eighteen Parties identified areas for further improvement of inventory data (table 7) which mainly address the problems mentioned in paragraph 117 above. Thirty-six Parties mentioned the need for financial and technical assistance to improve their inventories. In addition, Parties drew attention to the importance of continuous collection of data and/or the establishment of appropriate databases.

71. Parties have made efforts to improve the quality of their emission estimates. Several of them described the application of national emission factors or methods that better suit their national circumstances. Others compared estimates obtained using the IPCC methodology or default emission factors with estimates obtained using their own methods, models and/or national or regional emission factors. Some of these improvements related also to the enhancement of the collection of activity data.

72. Significant improvements in the completeness, transparency and quality of the inventories were recognized in the GHG inventories of Parties which updated their previously submitted

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[9] At the time when the UNFCCC guidelines were adopted, almost all non-Annex I Parties did not have emissions of HFCs. Later, at its fourth session, SBSTA adopted conclusions encouraging non-Annex I Parties to report emissions of HFCs, PFCs and SF_6 (FCCC/SBSTA/1996/20, para. 31).

[10] See decision 10/CP.2, annex, paragraph 4 (FCCC/1996/15/Add.1).

inventory data (table 8). In some cases, problems identified by a given Party in its initial GHG inventory were overcome in a later submission. This suggests that by preparing the GHG inventories on a continuing basis, the reporting and quality of inventory data can be improved and some of the difficulties overcome.

C. Presentation of results

73. Other reporting issues were also identified by the secretariat during the process of compiling the inventory information of the initial national communications:

(a) Different emission estimates for the same sector or source categories were indicated at different places or tables in the communication;

(b) In some cases it was not clear whether certain source categories were not reported because they were not relevant for the country or had not been estimated for other reasons. Most Parties did not use the notation keys indicated in the IPCC Guidelines;

(c) Some Parties changed the format of the IPCC summary tables.

74. Table 9 summarizes inventory data in terms of aggregate emissions and removals. The analysis provided in this section is based on 1994 inventory data, where possible. For some Parties, estimates have been converted into CO_2 equivalent estimates using 1995 IPCC global warming potentials in order to facilitate comparison of inventory results. Such a presentation shows, for example, the relative contributions of the different greenhouse gases and the different sectors to a Party's total GHG emissions. It should be noted that 36 Parties used the global warming potentials to estimate the relative contribution of each individual GHG or sector to their aggregate GHG emissions.

Emissions by sources and removals by sinks

75. All reporting Parties constitute a net source of GHG emissions, with the exception of seven Parties (BTN, COK, GHA, HDN, LAO, SYC, ZWE) which are a net GHG sink due to the relatively large CO_2 removals reported in the land-use change and forestry sector compared to emissions from all the other sectors. Eight Parties (BTN, COK, GHA, HDN, LAO, SEN, SYC, ZWE) showed that removals of CO_2 by sinks in land-use change and forestry exceeded total CO_2 emissions.[11]

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[11] In view of the different role of *the land-use change and forestry* sector in the different Parties - in some, this sector offsets total emissions, while in others it is a large source of emissions - and the request by the IPCC Guidelines to provide net emissions or removals in the different source categories of this sector, the term "total CO_2 emissions" in this document denotes the sum of CO_2 emissions from all sectors except CO_2 emissions and removals from *land-use change and forestry*. This enables presentation of the data in a consistent and comparable manner

Aggregate GHG emissions expressed in terms of CO_2 equivalent[12]

76. In terms of total GHG emissions expressed as CO_2 equivalent, carbon dioxide was the primary GHG for most Parties. For 15 Parties (BOL, CIV, COD, CRI, GHA, GRD, HND, LAO, LKA, LSO, MLI, NER, SEN, URY, VUT) CH_4 was the most important contributor to aggregate GHG emissions, and for five Parties (BTN, COK, JAM, VCT, WSM) N_2O was the highest contributor.

77. Energy, agriculture and land-use change and forestry constituted the most important sources of GHG emissions for the reporting Parties. Removals by land-use change and forestry in most Parties offset GHG emissions from this sector, with the exception of 11 Parties (CPV, CRI, IDN, LBN, LKA, LSO, NER, SLV, THA, TKM, URY). The energy sector was the largest source of GHG emissions for all Parties, except for 11 Parties (BTN, COD, JAM, LKA, LSO, MLI, SLV, VCT, VUT, WSM, URY) where the agricultural sector was the largest emitter, and four Parties (COK, CIV, GRD, HDN) for which land-use change and forestry was the most important source of emissions. Agriculture was the second largest emitter sector for most Parties.

78. The level of emissions varies widely among reporting Parties. Aggregate GHG emissions expressed in CO_2 equivalent, excluding land-use change and forestry, of all small island developing States amount to 149,151 Gg, which represents 6.7 per cent of the total emissions of all reporting Parties. Ten out of these 15 Parties have reported emissions lower than 1,000 Gg. In contrast, 10 reporting Parties have aggregate emissions totalling over 100,000 Gg, ranging from about 103,000 Gg (PHL) to above 388,000 Gg (MEX). Bhutan had emissions of 1,292 Gg.

Emissions of main greenhouse gases (CO_2, CH_4 and N_2O)

79. *Carbon dioxide*. Fuel combustion in the energy sector accounted for the largest share of CO_2 emissions for all Parties, except Bhutan, ranging from 74 per cent (BOL) to 100 per cent (AZE, COK, CIV, CPV, FSM, GRD, KIR, LAO, LSO, NRU, SYC, TUV, VCT, VUT, WSM) of total CO_2 emissions. For Bhutan, industrial processes constituted 58 per cent of the CO_2 emissions and fuel combustion the rest. Within the fuel combustion sector, energy industries was the largest source. Transport was the most important source for 13 Parties (30 to 79 per cent) and accounted for more than 30 per cent of CO_2 emissions from fuel combustion for all Parties. CO_2 emissions from international bunker fuels were reported by 28 Parties and were equivalent to between 0.3 per cent (MDA) and 212 per cent (SYC) of total CO_2 emissions. The land-use change and forestry sector as a whole constituted a net sink of CO_2 for 33 Parties.[13] For 13 Parties, emissions from the forest and grassland conversion subsector in absolute value exceeded the total net emissions or removals. In the case of three Parties (ECU, LBN, SLV), the largest emissions in the land-use change and forestry sector were from changes in forest and other woody biomass stocks. For 26 Parties, however, this subsector constituted the main removal by sinks. For seven Parties (ARG, CHL, CIV, COD, HND, LSO, MEX), removal by sinks in the subsector of abandonment of managed lands was larger than that from changes in forest and other woody biomass stocks.

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[12] Aggregate GHG emission estimates given in this document represent the sum of total CO_2, CH_4 and N_2O emissions expressed in CO_2 equivalent, using IPCC 1995 GWP values.

[13] Azerbaijan did not provide the source of data.

80. *Methane*. Agriculture was the largest source of CH_4 emissions ranging from 34 to 100 per cent of total methane emissions for 30 reporting Parties. Fugitive fuel emissions were the most important CH_4 source for six Parties (ARM, AZE, DZA, KAZ, TKM, UZB). These emissions accounted for between 44 to 87 per cent of total methane emissions. CH_4 emissions from the waste sector for 11 Parties (GEO, GRD, ISR, JOR, KIR, LBN, LKA, MUS, MYS, SYC, VCT) varied from 44 to 100 per cent. In the agricultural sector, livestock was the most important subsector for 42 reporting Parties, while either rice cultivation or other agricultural activities was the largest for the other Parties.

81. *Nitrous oxide*. Agriculture was the most important source of N_2O emissions for 31 reporting Parties, ranging from 49 per cent (MEX) to 100 per cent (TUV, UZB), while fuel combustion was the largest source for nine Parties with values ranging from 58 to 100 per cent. For Zimbabwe, industrial processes constituted the most important source of N_2O, while for some Parties the land-use change and forestry sector was the most important source with values ranging from 43 to 100 per cent.

D. Current trends

82. In addition to the inventory data for the base years 1994 or 1990 requested by the UNFCCC guidelines, 12 Parties (ARG, AZE, BOL, GEO, GHA, IDN, KAZ, MDA, NER, URY, VCT, UZB) provided a complete GHG inventory for both 1990 and 1994, allowing for preliminary analysis of the trends of GHG emissions in these countries. Additionally, the Republic of Korea and Zimbabwe also presented 1990 and 1994 emission estimates for the energy sector only. Armenia provided inventory data for 1990 as well as estimates for the main IPCC source categories. 1994 estimates of GHG emissions in terms of CO_2 equivalent for the years 1990, 1994, 1995 and 1996.

83. Total CO_2 emissions (excluding land-use change and forestry) increased over the period 1990 to 1994 by 7 per cent (GHA), 10 per cent (URY), 17 per cent (VCT), 18 per cent (ARG), 24 per cent (BOL) and 33 per cent (IDN), while total CO_2 emissions declined by 11 per cent (UZB), 22 per cent (KAZ), 27 per cent (AZE) and 57 per cent (MDA). Trends in CO_2 emissions differed when the land-use change and forestry sector was included in total CO_2 emissions. In this regard, the increase in total CO_2 emissions was higher by 4 per cent (IDN), 27 per cent (ARG) and 36 per cent (VCT), while in Uzbekistan, Azerbaijan, Kazakhstan and the Republic of Moldova the decreases in emissions were 11, 23, 24 and 60 per cent, respectively; in Bolivia, Uruguay and Ghana the increase became a decrease by 33, 42 and 56 per cent, respectively.[14]

84. CO_2 emissions from fuel combustion increased in 1994 compared to 1990 for six Parties (ARG, GHA, IDN, KOR, VCT, URY), while another six Parties (AZE, GEO, KAZ, MDA, UZB, ZWE) reported a decline. The largest increase was reported by the Republic of Korea (43 per cent), and the sharpest decline by Georgia (83 per cent).

85. Between 1990 and 1994, CH_4 emissions increased in eight countries (ARG, BOL, GHA, IDN, KAZ, URY, UZB, ZWE) by amounts ranging from 2 to 17 percent. Emissions decreased

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[14] For Uruguay, the *land-use change and forestry* sector was a net CO_2 emitter in 1990, while in 1994 it was a net sink. The Party explained that this change was a consequence of an implemented policy.

significantly, however, for Georgia (54 per cent) and Azerbaijan (40 per cent).[15] Total N_2O emissions in 1994 increased in five Parties (ARG, BOL, GHA, IDN, URY) compared to 1990 levels (4, 139, 14.8, 0.2 and 3 per cent, respectively), and sharply decreased for six Parties (AZE, GEO, KAZ, MDA, VCT, UZB) by amounts ranging from 9 to 94 per cent.

V. MEASURES CONTRIBUTING TO ADDRESSING CLIMATE CHANGE

86. Most reporting Parties provided information on programmes containing measures that could contribute to addressing climate change by limiting the increase in GHG emissions and enhancing removals by sinks. The level of reporting, however, varied significantly among Parties. Some Parties presented a portfolio of measures aimed at reducing GHG emissions, while others included emissions projections as well as possible abatement measures by sectors. Furthermore, other Parties also provided a list of projects aimed at reducing GHG emissions and enhancing removals by sinks.

87. Estimations of the cost of abatement options also varied among Parties. Few Parties provided cost-benefit analysis of abatement options; some provided merely rough estimates of costs. In some cases Parties included information about the cost of each measure, and strategies for implementation of the selected measures.

88. The sectors covered in the abatement analysis tended to follow closely the categories specified in the GHG inventories. The number of non-Annex I Parties reporting on abatement options, by sector, were: 49 energy, 31 agriculture, 44 forestry and 26 waste (table 10). National criteria for prioritization and selection of abatement options were generally not reported.

89. Some Parties elaborated on the methodologies used to identify potential abatement measures, and a number of these Parties generated scenarios for projecting future emissions using either sectoral, national or global parameters. A number of reporting Parties constructed a single socio-economic scenario while others developed several socio-economic scenarios, the main variables being demography, GDP and demand for electricity. The selection of abatement options was based on expert judgement, national development programmes and the use of sophisticated models, mainly in the energy sector.

90. Many Parties also pointed out that identified options have not been comprehensively assessed and that further assistance and studies will be needed to conduct detailed cost-benefit analysis to assess the feasibility of these options, and to identify the relevant entities and social players on whom these costs or benefits will fall.

91. Some Parties provided emissions projections based on the application of one or more of the proposed abatement measures with varying projection periods and the sectors.

A. Energy

92. Forty-nine reporting Parties reported on some possible actions to limit GHG emissions from the energy sector. The reported measures were diverse but generally covered the supply and demand sides and included energy conservation and efficiency, fuel switching and the use of

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[15] Due to incomplete reporting for the year 1990, Zimbabwe was not taken into account for this comparison.

renewable energy. Many Parties identified measures by subsectors including industrial, residential, commercial and transport sectors.

93. Some of the measures identified in the commercial, industrial and residential sectors were, inter alia: energy cogeneration, increase in energy efficiency, promotion of energy saving through the introduction of efficient appliances, building standards, increase in efficiency of thermal electricity generation, increase in efficiency of heating or hot water supplies, establishment of energy intensity targets, banning low-efficiency appliances, reduction of electricity transmission and distribution losses, use of cleaner fuels such as low sulphur fuels or liquefied petroleum gas, and application of market prices, removal of subsidies, and energy pricing policies.

94. The range of measures reported by Parties in the transport sector included promotion and or use of cleaner fuels or fuels derived from biomass, promotion of hybrid electric vehicles, improvement of modes of transport, such as road, railway, subway, bicycle and river transportation systems, improvement of vehicle maintenance or replacement of old vehicles, public awareness campaigns, education of drivers and promotion of car pooling, imposition of tariffs or taxation on cars, use or imposition of varied road tolls or traffic management, and discouraging the importation of used vehicles. Other measures included encouraging the penetration of hydrogen-based fuels in the transport sector, rationalizing of urban and inter-urban transport and the introduction of small engine capacity cars with less energy consumption.

95. Most Parties identified the following measures in the area of renewable energies: hydropower, solar and wind energy promotion, fiscal incentives for the use or development of renewable energy technologies, use of biofuels or development of related technology, gasification or biomass digester usage, and use of geothermal energy. Apart from renewables, Parties also reported on the use of non-fossil fuel sources such as nuclear energy.

96. Some Parties elaborated on the methodology used to estimate the mitigation potential of the planned or implemented measures. Reporting Parties mentioned the use of model(s), simple cost benefit analysis and the judgement of experts. The mitigation analysis tools used included LEAP, ENPEP, MARKAL, STAIR, ETO, RASTR and "National Renewable Energy Laboratory methodology for the economic evaluation of energy efficiency and renewable technologies".

97. Some Parties included estimates of the emission reductions associated with the reported measures. Among these Parties, some provided the estimated reduction potential associated with the implementation of the measures relative to the national emissions, whereas others provided estimates based on primary energy saved. In most instances, based on the limited information provided by Parties, it was difficult to discern the exact level of implementation of the reported measure.

98. Most Parties reported on the projected emission reductions associated with the implementation of the measures in the energy sector. This was done with the use of various time horizons: 2005, 2008, 2010, 2016/2017 (fiscal year), 2020, 2023, 2025, 2030, 2040 and 2050.

B. Agriculture

99. Most Parties (31) provided information on both planned and implemented measures to reduce GHG emissions from the agricultural sector. The measures reported included agricultural and livestock-related operations.

100. Options reported by Parties under agriculture included measures to reduce CH_4 emissions in rice cultivation such as improved farm management practices, changes in traditional farming practices, reduction of area under rice cultivation, shift to shorter-duration rice varieties, crop rotation, diversification and intensification of crops, promoting the use of low CH_4 emission rice cultivars, increase in area under directly seeded rice, provision of training and dissemination of information on mitigating CH_4 emissions from rice paddies, improved water management through soil aeration and periodic drainage of paddy fields, adoption of intermittent irrigation systems, incorporation of pre-fermented farm residues in organic matter amendment and use of chemical compounds to inhibit the production of methane.

101. Options identified by reporting Parties to reduce N_2O and NO_x emissions included plant nutrient management, appropriate and rational use of fertilizers, substitution of mineral fertilizers with organic and biological fertilizers, use of ammonium sulphate fertilizers instead of urea, use of a combination of phosphogypsum (hydrated calcium sulphate) and urea, use of composted rice straw instead of fresh rice straw, introduction of changes in irrigation, enhanced use of organic fertilizers and biorganic technologies, and promoting research, production and use of organic products.

102. Some Parties also identified as options for limiting emissions from agriculture the promotion of land use planning, promotion of improved agricultural practices, encouragement of integrated farming, promotion of low till or no till agriculture, banning of sugarcane burning prior to harvest, post-harvest management (including the avoidance of burning of farm waste), ploughing of vegetative waste into the soil, management and administration of grasslands, prevention and land control against land degradation, and changes in the use and handling of crop residues.

103. Measures to reduce emissions in livestock-related operations included improvement in practices of cattle management, optimization of livestock population, improvement of livestock production through diet alteration, use of nutrient supplement of urea-molasses mineral block, supplementing poor quality roughage with legumes and/or low-cost agriculture by-products, chemical treatment of low-quality roughage, use of monensic acid to reduce CH_4 production from ruminant fermentation, expansion of pasture and forage conservation for dry-season feeding, confined animal management, manure management, improvement of organic waste collection, utilization and storage, including wastes of animal husbandry complexes, use of biodigesters, and utilization of animal waste for energy production.

104. Other options identified by Parties were utilization of low water use crops, import substitution for agricultural products, introduction of improved coal-fired tobacco barns, agrarian reforms together with water economy, agricultural census, regionalization of agricultural research and development and food diversification, strengthening the capacity of planning, protection of and vigilance over protected areas, strengthening the legal framework in order to regulate the use of toxic agrochemicals, promoting policies aimed at reducing the use of pesticides and

supporting the research and extension programmes about management of environmental issues, establishment of forests or any other vegetation (perennials and grass) on degraded or non-forested lands and promotion of mixed cropping and agro-forestry, and implementation of a system of education and training.

105. In general, reporting Parties provided limited information on the methodology used to estimate the emission reduction potential of the identified measures. Two Parties (LAO, TKM) mentioned judgement of experts. Seven Parties (BOL, CIV, CPV, CRI, ISR, NER, THA) presented estimations of the GHG emission reductions that could be obtained with the application of the measures proposed. Three Parties (ARG, KAZ, UZB) included the estimated reduction potential associated with the implementation of the measures relative to the national emissions. Egypt included the estimated methane reduction potential associated with a reduction in the area under rice cultivation and for the use of improved management practices for rice cultivation. The Philippines estimated the methane reduction potential of identified measures in rice production. Argentina and Chile reported on the broad assumptions underlying their projections and also identified some sensitivities and uncertainties associated with the projections.

106. Six Parties (ARM, CPV, GEO, MDA, MEX, ZWE) reported projected emission reductions in 2010 associated with the implementation of measures in the agricultural sector. Three Parties (CHL, PHL, SYC) provided reduction estimates for the agricultural sector for the year 2020. Indonesia and Thailand reported on projected methane emission reductions for identified measures in livestock management and rice fields for 2020. Azerbaijan provided the reduction potential for the identified measures up to the year 2025. Bolivia reported the CO_2 emission reduction and costs for the year 2020, considering business as usual and mitigation scenarios.

107. Regarding the status of implementation of the reported measures in the agricultural sector, some Parties mentioned measures that are under implementation, while others mentioned the inclusion of some of the identified measures under national action plans. Many Parties stated that the measures identified could be implemented if the results of small-scale experimental field trials and or the resulting socio-economic effects were satisfactory and if adequate financial and technical support were provided. In many instances, however, due to the limited information provided by the reporting Parties, it was extremely difficult to discern the level of implementation of the reported measures.

C. Land-use change and forestry

108. Almost all the reporting Parties included measures relating to the enhancement of removals by sinks. The range of reported measures both planned and implemented included the preservation of existing forest cover, afforestation, reforestation, programmes for the development of commercial plantations, agroforestry, prevention and control of forest fires, control of diseases and pests, control of damage due to acid rain, woodland creation, promotion of low-impact logging, improvement of timber utilization, and conversion of low productivity lands into grasslands and rangelands.

109. Other measures identified by Parties included the planting of high biomass crops such as sugar cane, soil and watershed conservation, rehabilitation of wetlands, forest research, forest

management, bans on bush burning during land clearing and the promotion of fast-growing tree species, review of current forest and land management policies, forestry legislation, forestry administration plans and tax incentives encouraging reforestation, and sand dune stabilization. Further measures proposed include the establishment of development funds and public awareness and training programmes, enhancement of planning, protection of and vigilance over protected areas, sustainable management of protected areas, sustainable management of fragile ecosystems and native forests, development of forestry-livestock and agroforestry systems, provision of alternative livelihoods for communities protecting/conserving current forests, and education and sanctions to reduce the incidence of bush burning.

110. Several Parties also identified options which include revision of prices for timber trees, effective enforcement of a ban on chain-saw operations, sustainable supply of fuels, use of fast growing fuel wood, comparative studies on carbon sequestration potentials, establishment and extension of seed banks for the reproduction of local plant species, controlling commercial biomass harvest, controlling forest fires, reclamation of coastal lands, enforcement of existing regulations and controlling outbreaks of pests and invasive species.

111. In general, the reporting Parties provided limited information on the methodologies used to assess the identified measures. Bolivia presented the steps used for selection of the abatement options as well as the criteria. The Republic of Moldova made reference to national programmes and two scenarios of development. Four Parties (BOL, ECU, GHA, HND) used business as usual and mitigation scenarios for the analysis. Turkmenistan mentioned the use of judgement of experts. Azerbaijan included a reduction estimate for the sector. Georgia indicated difficulty in quantifying the reduction potential of identified measures. Armenia provided an estimate of the time period over which the estimated carbon uptake would occur through the use of afforestation, reforestation, forest protection and woodland creation. Some Parties provided average estimates of CO_2 uptake by measure. Four Parties (ARM, CIV, ECU, GHA) used the COMAP model. Ecuador mentioned the use of the COPATH model. Argentina employed a statistical regression model.

112. Indonesia and the Philippines made projections of carbon uptake for the period up to the year 2020. Azerbaijan included an estimate of the reduction potential of identified measures by 2025. Lesotho included CO_2 projections of a forest mitigation strategy for the period up to 2030. Bolivia presented the CO_2 emission reductions and costs by measure for two scenarios up to the year 2020. Thailand made projections of the forestry sector in CO_2 emissions up to the year 2020 and included the uncertainties encountered when forecasting emissions. The Seychelles presented projections for CO_2 removal for the year 2020. Ecuador forecast emissions for 2015 and 2030, Honduras for 2015, Ghana for 2020 and the Republic of Moldova for 2010.

113. On the status of implementation of the measures reported under this category, Egypt and Kazakhstan provided details of the area extent, and even species to be planted, and the Republic of Korea mentioned consideration of the enhancement of removals by sinks within the country's 10-year forest plans at regional and operational levels. Lesotho reported on its National Forestry Action Programme, the Philippines referred to its 1990 Master Plan for Forestry Development, and the Federated States of Micronesia referred to consideration of the enhancement of removals by sinks within their National Environmental Management Strategy Report. Mauritius mentioned the use of legislation. The Republic of Korea mentioned that it is at present using

development funds to support reforestation and silvicultural practices, as well as providing tax incentives. Mauritius referred to potential constraints in implementation, while Vanuatu mentioned a limited scope for further application of such measures. Indonesia categorized its forestry sector policies as being short, medium and long term; Bolivia stressed the need to support the implementation of its New National Forest Law. Costa Rica reported on two programmes it had implemented to help protect and increase its forests. Honduras mentioned that its National Forest Plan included several programmes which are aimed at promoting sustainable development in the forestry sector. Thailand launched a reforestation programme in 1994.

D. Waste management

114. Twenty-six Parties reported in a varying degree of detail on measures both planned and implemented to limit emissions in the waste management sector. The reported measures included integrated waste management, waste minimization at the production, distribution, consumption and disposal stages, waste recycling, improvements in organic waste collection, utilization and storage systems including wastes of animal husbandry complexes, composting, use of sanitary landfills, waste-water treatment, capacity-building for operation and maintenance of waste-water treatment plants and rehabilitation of waste-water treatment plants, recovery of methane from landfills and waste-water treatment plants, flaring of CH_4 from landfills, waste utilization for energy production, waste incineration, and the development of regulations to control urban industrial pollution. Other measures included the implementation of national environmental management strategies, education programmes, studies on appropriate packaging materials, legal instruments, the promotion of the private management of sewers, regulation and monitoring of agricultural and industrial sewers, organization and improvement of systems of waste accounting, and the implementation of non-polluting technologies.

115. Few Parties elaborated on the methodology used to estimate the emissions reduction potential of the identified measures. Argentina reported the use of a linear regression model, Armenia reported the use of a methodology which reflected the IPCC Guidelines source categories, the Republic of Moldova made reference to national programmes and two scenarios of development, and Turkmenistan referred to the judgement of experts.

116. Some Parties reported on projected emissions from this sector when mitigation measures were in place. Armenia identified a reduction in emissions due to the implementation of municipal solid waste and waste-water minimization options in 2010 relative to 1990 levels. Georgia estimated the reduction potential of identified measures up to the year 2010. Azerbaijan estimated methane reduction potential up to the year 2025. Israel assessed the economic costs and benefits of reducing emissions by the years 2010 and 2115. The Republic of Moldova indicated a contribution to emission reductions by 2010. Thailand indicated that forecasts of methane emissions for industrial waste-water were not attempted because of uncertainties regarding investments and waste-water characteristics, location, technologies and processes. Lebanon identified the anticipated quantity of waste entering municipal landfills, and the quantity of domestic and commercial waste-water being treated, by 2005 and 2040. Costa Rica forecast methane emissions in CO_2 equivalents for the years 2010 and 2015.

117. On the status of implementation of the measures reported in the waste management sector, Egypt mentioned the completion of studies leading to the preparation of

recommendations, and the formulation of a national action plan for the safe handling of solid waste; Kazakhstan referred to the inclusion of waste management in its national priority action plan; Samoa mentioned that it was included as a priority area in its National Environmental Management Strategy Report. The Republic of Korea indicated that implementation in this sector was proceeding under both the Waste Management Act and the Promotion of Saving and Reutilization of Resources Act. Lebanon stated that numerous projects were under way for the construction of waste-water treatment plants (domestic and commercial) but indicated that industrial waste-water treatment was not covered in the country's national industrial waste-water action plan. Georgia reported on methane emission reductions achieved during the implementation of the identified measures. Egypt included the costs of implementation of the national action plan over a 10-year time-frame. Indonesia described its time-frame for waste sector initiatives as short- and medium-term. Singapore indicated that as a matter of policy all incinerable waste is collected and incinerated to generate electricity.

E. GHG emissions reduction and enhancement of removals by sinks projects

118. Some Parties included in their national communications a list of projects aimed at reducing GHG emissions and enhancement of removal by sinks; others elaborated on the associated costs and/or mitigation potential of measures. Others even described project concepts which included descriptions of environmental and social benefits of the projects. In the energy sector, the mitigation projects identified in the energy supply were related primarily to efficient conversion of fossil fuels, switching to low carbon fossil fuels and to renewable sources of energy. On the demand side, transport sector projects were mainly relevant to energy efficiency improvements, infrastructure change, modal shift and fleet management. In the residential, commercial and institutional subsectors, projects were addressed to building equipment such as heating, cooling, water heating, lighting and cooking. In the industrial subsector, energy projects included introducing new technologies and processes, fuel switching and process improvements. In the agriculture sector the projects mentioned were related to land suitability evaluation studies, integrated watershed management and agricultural land conservation, rationalization of energy and water use, and replacement of agricultural machinery. For the forestry sector, Parties referred to mitigation projects relating to the removal of barriers to the use of fast-growing trees in the private sector, carbon sequestration potential and demonstration projects, carbon sequestration and sustainable management of forests, protection of existing forest cover, reforestation, afforestation, agroforestry, park restoration, forest rehabilitation and quantitative evaluation of the carbon sink potential of ecosystems. In the waste management area the projects identified were related to assessment of the best options for waste disposal, waste recycling, waste composting, the recovery of methane from landfills, commercial utilization of landfill methane, flaring of landfill gas, energy production from landfills, production of humus by processing the organic component of solid urban waste and manure, promotion of biogas technology, waste incineration and waste-water treatment. A detailed list of projects by country is maintained by the secretariat at the web page http://www.unfccc.int/program/nai/ncweb02.pdf.

VI. RESEARCH AND SYSTEMATIC OBSERVATION

119. With the exception of Singapore, all reporting Parties (tables 12 and 13) provided information on research and/or systematic observations in the areas relating to climate change

impacts, vulnerability assessment and adaptation options, and measures for addressing GHG emissions.

120. The areas in which ongoing or planned research programmes have been identified by Parties include the environment, biodiversity, forests, agriculture, water resources, coastal zones, and human health. Many of the ongoing and/or planned research programmes reported by Parties have been developed for climate change impact assessment in agriculture (24), water resources (25), coastal zones (17), environment (12), biodiversity (7), forests (16), livestock (5), human health (11), and others (19).

121. In addition, research programmes on adaptation options are also being developed by Parties for a number of sectors including agriculture (26), water resources (23), and coastal zones (13). The number of Parties who have ongoing and/or planned research programmes in the area of adaptation is less than those involved in impact assessments for the same thematic areas.

122. Most of the research activities identified or planned by Parties are related mainly to those activities included in climate change vulnerability and adaptation assessments including identification of adaptation options and mitigation strategies. Agriculture, water resources and coastal zones have been the most important areas for which research and systematic observations have been undertaken in most Parties.

123. Because information on research includes a range of activities other than climatic research, many Parties dedicated various sections to research and systematic observation. Some Parties devoted sections to systematic observation only, while others described only research. However, the scope, coverage and level of detail of the information in research and systematic observation varied widely.

A. Research

124. Apart from climatic research, Parties reported on a wide range of specific research activities on vulnerability and adaptation assessments, measures to address climate change and its adverse impacts, and measures to improve national inventories of greenhouse gases.

125. Twenty Parties (table 11) provided information on planned research programmes which will be undertaken if financial and technical resources were available. They however stressed the need for a more structured framework for undertaking studies dedicated exclusively to climate change.

126. Research activities proposed by Parties included studies on specific climate systems, ocean-atmosphere interactions, biogeochemical cycles, climatic and agro-climatic zoning, development of fast-growing and pest-resistant trees, and soil, water and forest conservation, and impacts on agriculture, water resources health, livestock and tropical ecosystems. Some Parties mentioned that they planned to undertake research into ways of improving climate forecasting capacity, classification of coastal zones, interactions between climate change and desertification, and socio-economic impacts of climate change. Others have provided information on studies of specific climate phenomena, such as the impact of the ENSO phenomenon and other extreme climatic events.

127. Many Parties have also identified areas for research and development which include relationships between incidence of diseases and climatic extremes, flood control measures, and elaboration and implementation of land use and forest policies. Other Parties have reported on their research programmes for monitoring carbon in forests, rises in sea level, the development of new varieties of crops, renewable energy, and coastal adaptation technologies, as well as air quality. Three Parties (MHL, LKA, VCT) have made mention of institutional arrangements which would facilitate research into identified areas.

128. Most of the reported ongoing and planned studies on adaptation options were concentrated on agriculture, water resources and coastal zones. Specific agricultural studies focused on improvements in crop yields, soil protection and fertilization, control of diseases and food resources and/or supply. Studies on water resources have been focused on hydrological modelling and on water supply. Coastal zone studies were oriented to capital risks and cost assessments, urban development and coastal engineering. Some research work was focused on the analysis of specific adaptation tools or management systems designed to deal with possible impacts in the areas of the environment, forest, livestock and human health (table 11).

129. Research on measures to address climate change concentrated on the energy sector, with particular regard to ways of improving energy efficiency and of improving the feasibility of using different types of renewable energy resources. Specific studies on agriculture, forestry, waste management, industry and transport were also mentioned. Five countries (ARM, FSM, KOR, LSO, ZWE) stressed the role of these studies as a basis for implementing national planning (table 11).

130. Other areas relating to GHG emission reduction or sequestration where research programmes were either ongoing or planned included agriculture, forestry, waste management, industry, transport and other areas of a cross-cutting nature, such as training of experts and capacity-building of institutions. Most of the Parties have been involved in a number of research activities relating to general research and development, applied research, demonstration and technology assessment.

131. Many Parties mentioned research programmes covering issues relating to inventories, such as the role of social and economic activities in GHG emissions and characteristics of greenhouse gases (KOR, MDA), the development of specific coefficients for different types of fuels (TKM, UZB) and methane emissions from agriculture and waste (ARM), the development of local emission factors in the areas of transport (ARG, CRI, LKA) and agriculture (URY), and the study of GHG emissions from land use practices in agriculture and forestry through remote sensing techniques and emissions from the power sector at the national level (CPV, HND, NER, ZWE). Some Parties stressed the need to expand national statistics and set up a database to develop projections (HND, KOR, MUS, UZB).

132. Some Parties presented information on studies relating to more general environmental and economic concerns, such as the use of economic instruments for environmental management, forest management and/or biodiversity conservation.

133. Parties provided information on their institutional arrangements for undertaking studies. These included research teams undertaking specific studies on GHG inventories, abatement measures, vulnerability and adaptation assessment, national institutions carrying out research,

and cooperation between private sector institutions and non-governmental organizations. Others included the creation of research programmes and the establishment of permanent links between governmental expert teams and national and international universities and research centres, as well as participation in regional and international research programmes. A few Parties have expressed their need to establish centres of excellence to undertake research and to provide policy advice (MHL), a centre for climate change studies dedicated to research on the economic, ecological and social impacts of climate change (LKA) and a regional climate centre to provide modelling and technology for adaptation (VCT).

B. Systematic observation

134. The compilation and synthesis of information under this section was guided by the "UNFCCC reporting guidelines on global climate observing systems" adopted at the fifth session of the Conference of the Parties (FCCC/CP/1999/7). Information in this section has been structured in a format that is consistent with these guidelines because of their usefulness in facilitating the writing of the report.

135. Many Parties described the salient features of their national plans or programmes on systematic observations to meet the needs for meteorological, atmospheric, oceanographic and terrestrial observations of the climate system. The status of these national plans as well as the time-frames for their implementation were not dealt with in detail.

136. While some Parties reported systematic observations dating back to 1774 (MUS), 1844 (GEO), 1847 (AZE), 1876 (UZB), 1885 (ARM), and 1941 (CHL), other Parties reflected a far more recent creation of observation stations, such as the installation of a sea level and climate monitoring station in 1993 (NRU). Many other Parties did not specify the precise time of commencement of systematic observations.

137. Some reporting Parties made specific references to the type and number of their observation stations (table 12). The terminology used by Parties to describe the network of systematic observation stations was quite varied, and included meteorological[16] (22), climate[17] (9), synoptic (6), rainfall (9), hydrological (10), oceanographic (15), upper air (4), aeronautical (4), radar (6), satellite (7) and GHG monitoring (3).

138. Some Parties reported on special observation stations for monitoring background air pollution (KOR, PHL), ultraviolet radiation (CHL) and ozone (CHL, PHL, KOR). To ensure consistency in the use of the terminologies, an attempt has been made to categorize these types of observation units constituting the network as shown in table 12. Observations from river and lake sites (ARM), ships, aircraft and drifting buoys (MUS) were also reported.

139. The Cook Islands reported on the presence of automatic weather stations, whereas the Republic of Korea referred to an auto-controlled network taking marine, earthquake and lightning measurements. The fact that some of the stations within each national network form part of regional and global monitoring networks was also reported. Armenia and the Republic of Korea reported on the provision of national data on systematic observations to other Parties and

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[16] Some Parties also used the terms meteorological observatories and posts.

[17] Some Parties also used the terms climatic stations, climatological stations and reference climate stations.

international data centres, but neither Party made any reference to the existence of national policies and guidance relevant to such an exchange, nor to the existence of any barriers.

140. The national implementation capacity needs relating to maps, data banks, statistics and research are indicated in table 13. Twenty-eight Parties have expressed their need to develop data banks to store data from systematic observations, while 20 Parties have indicated a need for further research work, and the development of thematic maps and statistics. In addition, some Parties emphasized a need for the publication of climatic data and the placing of these data on the Internet.

141. Twenty-seven Parties (table 14) reported that they are currently involved in both regional and international cooperation programmes for systematic observations. Participation at the regional level was reported by 22 Parties in considerable detail (table 14) and 19 Parties provided information on their participation in global networks and "cooperative projects", particularly the programmes coordinated by the World Meteorological Organization (WMO), such as the Global Air Watch (GAW), the Global Climate Observing System (GCOS), the World Climate Programme (WCP) and the World Weather Watch (WWW) (table 14). The efforts of organizations such as the United Nations Environment Programme (UNEP), which manages the Global Environment Monitoring System (GEMS) in collaboration with the World Health Organization (WHO), and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO), which coordinates the Global Ocean Observing System (GOOS), have been reported by some Parties.

142. Many of the Parties which reported on systematic observations included a reasonably detailed consideration of the difficulties encountered as well as the needs which would have to be met to improve the current level of reporting. Some of the gaps identified by Parties in the present reporting on systematic observations included irregular observations, lack of data collection, outdated systems of collection, difficulties in processing and transfer of observational data, absence of automation in observation stations, outdated hardware and software, lack of trained personnel for use of satellite monitoring equipment, and the failure of the existing monitoring networks in meeting the requirements of the World Climate Programme (table 15).

143. The needs identified for systematic observation relate to financial support, rehabilitation and expansion of existing networks, creation of data banks, and capacity-building relating to enhancement of modelling and prediction, equipment and data transfer systems, networking with national and international universities and development of software for data processing and database. Many Parties also reported that they have been participating in the research and observation programmes coordinated by WMO, FAO, UNEP and UNDP.

VII. CLIMATE CHANGE IMPACTS, ADAPTATION AND RESPONSE STRATEGIES

A. Climate change impacts and vulnerability

144. The reporting guidelines of the UNFCCC provide that "Parties may present information on their specific needs and concerns arising from the adverse effects of climate change and/or

impact of the implementation of response measures" [18] and should seek to include, as appropriate, "policy options for adequate monitoring systems and response strategies for climate change impacts on terrestrial and marine ecosystems, and policy frameworks for implementing adaptation measures and responses strategies in the context of coastal zone management, disaster preparedness, agriculture, fisheries and forestry with a view to integrating climate change impact information, as appropriate, into national planning processes", as well as "building of national, regional and/or subregional capacity, as appropriate, to integrate climate change concerns into medium and long-term planning".[19] Parties are also invited to report on their needs "relating to the assessment of national, regional and/or subregional vulnerability to climate change".[20]

145. Fifty-one Parties presented information in their national communications on vulnerability to and impacts of climate change. Three of these Parties stated their vulnerability to climate change without undertaking the assessment.

146. Information on vulnerability and adaptation indicates that many non-Annex I Parties are highly vulnerable to the impacts of climate change and that some of these Parties are already experiencing strong climatic stresses (floods, drought, salt water intrusion, desertification) which will be exacerbated by climate change. Small island States and countries with low-lying coastal areas are also very concerned about sea level rise that could affect their national economies negatively.

147. The scope, coverage and level of detail of the reporting varied considerably among the Parties. The methods and approaches Parties used in their impacts and vulnerability assessments are outlined in table 16. A summary of results of the assessments by sector is presented in table 17. More than half of the reporting Parties provided information on both methods and results, including analyses of uncertainties associated with the methods used; others limited their reporting to the assessment of the impacts.

Methods and approaches used

148. Most non-Annex I Parties have used the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations, the UNEP Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies, and the Vulnerability and Adaptation Assessment: An International Handbook prepared by the United States Country Studies Programme to guide their assessment work.

149. Forty-six Parties reported on the use of various methodologies and approaches for assessment of impacts and vulnerability which ranged from the use of sophisticated computer models to qualitative assessments based on expert judgement and literature review (table 16). The methodological approaches used by Parties were generally consistent with the analytical framework provided in the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptation.

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[18] Decision 10/CP.2, annex, paragraph 5 (FCCC/CP/1996/15/Add.1).
[19] Decision 10/CP.2, annex, paragraph 5 (FCCC/CP/1996/15/Add.1).
[20] Ibid., paragraph 22.

150. Many Parties used general circulation models (GCMs) for generating climate change scenarios. Seventeen Parties reported on the use of the MAGICC-SCENGEN[21] model for generating regional climate change scenarios based on GCM output, which indicated that their future socio-economic situation could exacerbate their vulnerability to climate change.

151. Most Parties reported on developing climate change scenarios for time-horizons of 2050 and 2100 using the outputs from equilibrium and/or transient general circulation models. Thirteen Parties (table 16) used incremental climate change scenarios in their assessment of sensitivity of various biophysical systems.

152. Some Parties applied statistical and analogue methods, others used regionally-developed methods and/or historical records for developing scenarios for time-frames of between 50 and 75 years. Four Parties (MUS, PHL, SLV, WSM) reported on using statistical approaches for analysing the relationships between mean climate change and extreme events, while Argentina used a downscaling method to generate scenarios.

153. Most of the Parties (table 17) which analysed impacts on coastal zones used the IPCC scenarios for sea level rise which assume a 0.5 and/or 1.0 metre rise in sea level by 2100. In addition, one Party used historical data analysis for developing the sea level rise scenarios. Four Parties applied aerial video-assisted vulnerability analysis, which uses detailed field data to identify land and infrastructure at risk.

154. Many Parties (table 16) reported on developing baseline climate and socio-economic scenarios to examine the conditions of the sectors and systems; others have provided an analysis of the changes in temperature and precipitation over the past 50 to100 years. Some Parties used qualitative tools in evaluating socio-economic impacts, while others provided an analysis of integrated impacts across some sectors.

155. Fourteen Parties used climate change scenario data as input to the different models that were applied in assessing the potential impacts of climate change. Some Parties used models such as the Decision Support System for Agrotechnology Transfer (DSSAT), a software which integrates crop growth models with crop, weather and soil data to analyse the impacts of climate change on agricultural crops. Other simulation techniques used included SPUR2,[22] CLIRUN,[23] and the Holdridge Life Zones Classification System[24] (table 16).

156. Fifteen Parties used national models for impacts assessment, particularly for agriculture, water resources and terrestrial ecosystems. Some Parties did not specify the methods or approaches they used in assessing impacts in various sectors, and their assessments have been based on qualitative considerations (table 16).

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[21] Model for the Assessment of Greenhouse Gas-Induced Climate Change (MAGICC) and SCENGEN is a global and regional Climate Change Scenario Generator (MAGICC/SCENGEN).

[22] The SPUR2 suite of models simulates the effects of climate change on grassland ecosystems and cattle production. The package includes sub-models for plant growth, hydrology/soils, animal production and grasshopper infestation.

[23] CLIRUN. Water balance model using monthly mean values of temperature and precipitation and modelling a river basin.

[24] Holdridge Model/Holdridge Life Zones Classification. This model relates the distribution of major ecosystems ("life zones") to the climate variables of biotemperature, mean precipitation, and the ratio of potential evapotranspiration to precipitation (PET ratio).

157. Most Parties focused on identifying the biophysical impacts of climate change, i.e. sensitivities of systems to climate change. Others reported on an analysis of socio-economic conditions and an initial analysis of adaptive capacity for coastal zones, agriculture, water resources and forests.

158. A few Parties evaluated vulnerability by using vulnerability indices which took into account changing socio-economic and environmental conditions, such as population distribution and growth, urbanization, mortality and water consumption. Mexico presented a table comparing vulnerability indices for the baseline climate and doubled CO_2 conditions that showed sectors and specific areas most vulnerable to climate change.

159. Most Parties tended to focus their assessment of climate change impacts on each sector in isolation from each other. Some Parties, however, considered the impacts across several related sectors. Egypt used the DSSAT model and Mexico and El Salvador used their national methods to assess the integrated impacts on agriculture and water resources.

160. Lesotho provided a matrix which illustrated the interaction between changes in water resources, ecosystems, health and settlements, and Samoa presented a flow chart depicting the effects of storm surges and cyclones on coastal infrastructure, human health, soils and water supply.

161. Many Parties noted a number of important limitations in their analysis, which related to the methodologies and the availability of data. Almost all Parties highlighted the limitations of using general circulation models for developing climate change scenarios due to a large spatial scale of the GCM outputs. Parties noted also that, since the models are not able to simulate present climate, especially precipitation, accurately enough at a regional level, the magnitude and even the direction of change of many important climate variables, especially climate variability including extreme events in the future, is uncertain.

162. Many Parties also reported the ways in which existing climate change scenarios constrain their ability to assess their vulnerability. Of particular note is the inability to develop scenarios for climatic and/or oceanic conditions at a national level at scales appropriate for sectoral studies.

163. Parties also reported that the IPCC projections are often extended to periods when climate change will be the dominant driver of change, which increases the uncertainty of projections, particularly with respect to political processes of policy and decision-making.

164. The majority of Parties mentioned that, although recommended simulation techniques (such as DSSAT3, SPUR2 and the Holdridge model) proved to be sufficient for making general estimations, many of these often needed to be adjusted or adapted to reflect local sectoral conditions and climate variability better. Commonly mentioned were methodological problems such as a lack or inadequacy of local specific environmental and socio-economic data and methodologies, a lack of methodologies for integrated and socio-economic assessments, and a lack of understanding of the magnitude of climate change impacts on water resources, human health, fisheries, coral reefs and local ecosystems.[25]

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[25] See also section C, Implementation capacity.

165. Many Parties also indicated that they had had many problems in applying the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations. Many of these difficulties had been related to suitability of methods and tools, lack of national capacity to apply these methods and tools, lack of data, and a lack of institutional frameworks and financial resources required to undertake these assessments.

Results

166. The vulnerability and impacts assessment presented in the national communications covered the following six main sectors: agriculture and food security, water resources, coastal zones and marine ecosystems, fisheries, human health and terrestrial ecosystems. The choice of sectors for analysis in most cases depended on the national circumstances, and on the importance of a particular sector to the national economy. Five Parties (ARG, DZA, EGY, LBN, MEX) also reported on impacts of climate change on energy, industry and/or human settlements; Armenia assessed impacts on mountain and freshwater ecosystems, the Federated States of Micronesia and Lesotho on wildlife and biodiversity, Cape Verde and Grenada on tourism, and the Republic of Moldova on soils (table 17).

Current vulnerability and climate scenarios

167. Most Parties reported in varying levels of detail on both baseline (climate and socio-economic) conditions and conditions under various climate change scenarios. Climate change scenarios in most national communications were presented in greater detail than the results of the impacts assessment. Forty-seven Parties provided quantitative descriptions of the scenarios, including the use of tables and graphs (table 17).

168. Most countries, having analysed their present climate conditions, stressed that they were already vulnerable to current climate and climate-related events and phenomena that could be exacerbated by future climate change. The small island developing States and countries with a long coastline pointed out that they experienced severe floods, drought, changes in the ENSO phenomenon, tropical storms, salt water intrusion, storm surges, coral reef damage, and changes in migratory patterns of important fish. Other countries stated that the aridity of their climates and their location in marginal areas had already made them vulnerable, and the adverse effects, particularly on agriculture, food security and water resources, would most likely be exacerbated by climate change.

169. Many Parties recognized the significance of the ENSO phenomenon and its impact on their economies. Most of them indicated that they would have to strengthen their national meteorological services, climate monitoring activities and their disaster management capabilities in order to be able to minimize the impacts resulting from the ENSO phenomenon.

170. Parties expressed concern that future climate change would lead to an increase in the frequency of extreme events, such as droughts, floods and hurricanes. The poor understanding of the relationships between climate change and the frequency and intensity of extreme events was highlighted. Three Parties (PHL, SLV, WSM), however, mentioned that the statistical or historical analogue analysis of the relationship between mean climate characteristics and the frequency of extreme events, including the ENSO, showed a likelihood of extremes increasing under future climate change.

171. All Parties stressed that the projection of regional precipitation changes are uncertain, as some scenarios indicated an increase in precipitation and others indicated a decrease in precipitation for the same country.

172. The Parties which analysed their socio-economic scenarios (table 16) stated that future changes in the socio-economic situation will most likely exacerbate their vulnerability to the adverse effects of climate change. A number of Parties pointed out that projected rapid population growth, high food demand, and land and ecological degradation would make their countries increasingly vulnerable to potential climate change.

Agriculture and food security

173. Forty-five reporting Parties (table 17) assessed vulnerability of the agriculture sector. Generally, the results presented were more detailed and extensive for this sector than for the others, while the level of detail and depth of the presentation of the methods and results was still very diverse, ranging from detailed maps and tables to a qualitative description.

174. Parties reported the use of crop models, such as CERES-Wheat, CERES- Maize and CERES-Rice within the DSSAT3 package and COTTAM (e.g. EGY), and the use of national models (SLV). Some countries reported in their assessment on the fertilization effect of increased atmospheric concentration of CO_2. Four small island developing States (CPV, GRD, SYC, VCT) reported on possible agricultural losses as a consequence of sea level rise.

175. The reporting Parties examined the vulnerability of more than 10 specific crops and cultivars, such as wheat, maize, rice, corn, cotton, vegetables and grapes, under a variety of climate change scenarios. Several Parties (LSO, MDA, TKM) presented the results of impact assessment for grasslands and livestock productivity.

176. The results are not comparable across the countries because of the wide variety of methods and approaches used by Parties in their assessments. The estimated changes in crop yields and livestock production as reported by the Parties (table 17) were both positive and negative, although decreases predominated. The increases ranged from 10 to 40 per cent (across Parties) as compared to the baseline conditions, whereas the estimated possible decreases ranged from 15 to 50 per cent.

177. In most cases impacts reported were mixed depending on the crops examined, time-frames, and different locations of countries. For example, the Philippines noted that maize yields could be more negatively affected than rice yields; Egypt estimated an increase in cotton and a decrease in wheat and maize production. Kazakhstan reported an increase in wheat production under one GCM scenario and a decrease under another.

178. Possible adverse effects of climate change on agriculture identified by Parties included lower soil moisture, greater levels of infestation by weeds and pests, the spread of infectious diseases and a decrease in biodiversity. Possible positive climate change impacts for some types of crops, as identified by some Parties, included an increase in crop production resulting from the longer growing season, and increased CO_2 concentration in the atmosphere.

179. Assessments of livestock were often varied, however, most Parties (table 17) anticipate a decline in livestock production, as a result of either a decrease in pasture areas or a decrease in

the productivity of existing pastures. Kazakhstan expects lower nitrogen content of fodder and lower protein levels, which would in turn diminish its nutritional value for livestock. Armenia expects a 30 per cent reduction in the number of cattle. Lesotho reported an expected worsening of the forage situation under some climate scenarios, while Argentina and Azerbaijan reported an expected positive impact on grasslands under a range of scenarios, due to the higher level of CO_2 concentration and a prolonged growing season.

180. A number of Parties (HND, SLV, WSM) mentioned that climate variability, including extreme events, could be a more critical concern in the short term than the effects of changes in mean climate conditions. For example, three Parties (LSO, URY, UZB) noted that although an increase in grassland productivity could be expected under most climate change scenarios due to warmer temperatures and higher CO_2 concentration, increased climate variability would be detrimental to the production of crops and grasslands. Four Parties (ARG, CHL, PHL, URY) stressed that an increase in precipitation would affect agricultural production tremendously because of the increased frequency of flooding.

Coastal zones and marine ecosystems

181. Thirty-five Parties (table 17) reported on the assessment of climate change impacts on their coastal zones. The coastal vulnerability was assessed in most cases by analysing the potential impacts of specified levels of sea level rise on coastal zone infrastructure and marine ecosystems. Azerbaijan and Georgia reported on their assessment of possible climate change impacts on coastal zones and ecosystems of the inland seas, namely the Caspian Sea and the Black Sea, while Turkmenistan and Uzbekistan reported on estimated impacts on the coast of the Aral Sea.

182. The presentation of results varied from qualitative considerations to detailed quantitative analysis including tables and maps, illustrating expected land and/or economic losses from inundation and erosion due to sea level rise. Half of the Parties reported in qualitative terms land loss due to inundation and erosion caused by sea level rise.

183. Almost all Parties with coastlines reported on the potential adverse effects of salt water intrusion and storm surges on their coastal infrastructure and ecosystems. Three Parties (MEX, SEN, URY) reported that they are more vulnerable to storm surges than to sea level rise alone. Georgia reported on possible cooling of the Black Sea as a result of changes in sea water circulation brought about by climate change, and the subsequent adverse effect this would have on tourism, as well as on the unique subtropical coastal ecosystems.

184. In most cases, Parties reported on the possible impacts of sea level rise on particularly important or vulnerable coastlines. Kiribati estimated the impacts of sea level rise on its entire coast. The Philippines reported that sea level rise would have serious consequences for its extensive mangrove ecosystem, and five Parties (COK, CPV, HND, MEX, SYC) stressed the likelihood of adverse impacts of extreme events on their coastal zones where the majority of their socio-economic activities, infrastructure and human settlements are located.

185. For all Parties with significant coastal resources, the major concern is the wider adverse impacts that climate change and sea level rise would have on their economies. Some Parties specifically stressed that a rise in sea level of 0.5 to 1.0 m would affect most of their valuable

agricultural land and their densely populated and settled areas. For example, Argentina noted that one coastal area, where a third of its population lives, would also be the most exposed to inundation in the case of sea level rise. Egypt and Senegal mentioned that their major and/or rapidly expanding cities are located on low-lying lagoonal coasts which are most vulnerable to sea level rise. Ghana reported that about 4.0 million people (25 per cent of the total population) would be at risk with a sea level rise of 1.0 m along its coastline.

186. Parties also noted the possible negative impacts of sea level rise on coastal lands, biodiversity and marine ecosystems. Coral reefs, coastal soils, mangroves, estuarine wetlands and low-lying coastal ecosystems are expected to suffer as a result of salt water intrusion, temperature change and increased intensity and frequency of storms. The Philippines and Vanuatu estimated that the effect of possible sea level rise on mangrove populations and sea meadows would be slightly positive.

Water resources

187. Forty-five reporting Parties (table 17) provided information on the expected impacts of climate change on their water resources. Of these, more than half provided estimates of climate change impacts on their hydrological resources (such as runoff) obtained from different water balance models. All these Parties reported on the results of an assessment of changes in runoff for separate river basins, watersheds and lakes. They stressed that the effect of climate change on runoff is very difficult to predict, because of the high level of uncertainty in assessing changes in precipitation at the regional level. In addition, six countries presented qualitative considerations of how projected climate change and sea level rise would affect regional water availability and quality.

188. Most Parties stated that they already face various problems of water supply. The Philippines, for example, mentioned that they experienced severe water supply problems caused by a rapid increase in population, growing demands from agriculture and industry, expanding urbanization, unabated pollution of water bodies and the effects of climatic variability and extreme events. Lesotho stressed that it had been facing a water crisis for many years. Five Parties (AZE, EGY, KAZ, SGP, UZB) mentioned that their water resources were not sufficient to satisfy all their needs. Other Parties found that per capita water availability is anticipated to decline due to population growth and urbanization, with or without climate change. The impacts of climate change on the supply-demand ratio are expected to be positive for some countries under some climate change scenarios and negative for others.

189. Most Parties provided information on the negative impacts of climate change on their water resources. Positive impacts were mentioned by only a few Parties (e.g. BOL, HND, ISR). Many Parties indicated the effects that extreme events would have on precipitation and on their water resources. Honduras indicated that floods and droughts could affect their agriculture as well as the production of electricity and the supply of drinking water.

190. Some of the impacts that climate change would have on water resources include higher rates of evaporation from hydro dams, affecting available reserves for power generation, increase in the frequency and intensity of surface runoff, decrease in surface water, reduction in aquifer recharge, soil erosion, and drought (CIV, ECU, ISR, LKA). High-intensity rainfall and drought

would contribute to biomass degradation and would affect fishing, food production, transport and even land conflict (MLI).

191. Some countries forecast a reduction in runoff or a tendency toward decreased runoff under all scenarios (table 17). Three countries (ARM, AZE, KAZ), for example, expect a reduction in runoff of up to 30 per cent, and Zimbabwe of up to 50 per cent. The other countries estimated both positive and negative changes in runoff under different climate change scenarios and/or for different periods of time or seasons. Some countries indicated that changes in estimated runoff could be quite large, and stressed that this wide range of future changes in runoff is likely to substantially increase the risk of extreme events, drought and floods (table 17).

Human health

192. Twenty-six Parties reported the results of their assessment of vulnerability for human health. Parties reported that there is a lack of data and a limited understanding of the relationships between health and climate characteristics. Consequently, no models were run to assess impacts on particular diseases and most Parties presented qualitative assessments (table 17). Armenia and the Philippines presented an initial assessment based on a statistical correlation between climate characteristics and population data relating to a number of diseases.

193. While noting the uncertainties, all Parties found that an increase in temperature, variation of precipitation and air pollution would lead to a proliferation of diseases and increased risk to human health. A number of Parties pointed out that climate change and sea level rise are expected to have both direct and indirect impacts on human health.

194. An increase in incidence was predicted for vector-borne diseases, such as malaria and dengue; water-borne diseases, such as cholera, typhoid and heat stress, cramps, dehydration, rashes; vascular and renal disorders; viral conjunctivitis and influenza (BOL, BTN, GRD, LKA MHL, MUS, NER, THA). Parties also noted that there could be an increase in cardiovascular diseases as a result of increases in temperature.

195. Five Parties (ARM, LSO, MUS, PHL, WSM) emphasized that existing poor conditions, inadequate potable water, and low government support and allocation of resources to health and the environment, would exacerbate health impacts from climate change.

Terrestrial ecosystems and forests

196. Thirty Parties presented information on the impact of climate change and climate variability on terrestrial ecosystems, which include forests and rangelands.

197. Most Parties reported on an evaluation of the impacts on their forests and rangelands in terms of changes in biomass or the suitability of the land under projected climate change, as well as a general shift in species composition of forests and vegetation types in warmer climates. Although not directly comparable across countries due to the different models used (table 16) and different magnitudes of change estimated (table 17), the impact on forests and grasslands was found to be negative in most cases, either due to a decrease in biomass or to other climate change related factors. For example, Mexico mentioned an expected loss of 10 per cent of forest

vegetation, while Armenia reported an anticipated 15 per cent decrease in annual growth of woody biomass.

198. For some forest and grassland ecosystem species, an increase in biomass, especially in the first stage of global warming, was estimated. The Republic of Korea, for example, reported that the decline of its forests would begin 30 years after a change in climate, while severe damage would occur after 100 years. Azerbaijan noted that its total area of coniferous forest is expected to decrease by 2.5 per cent by the time CO_2 concentration in the atmosphere is doubled, while the area of some woody species may substantially increase by that time.

199. Several Parties reported on their assessment of the shifts in natural climatic-ecosystem zones due to expected climate change. Some Parties reported an expected intensification of desertification and an increase in arid or semi-arid areas under all climate change scenarios. Argentina, for example, noted that aridity could expand into subtropical areas (north of the 40th parallel) due to an increase in temperature and evaporation. Armenia and Kazakhstan noted that the arid area could expand by 20 to 40 per cent.

200. Some of the impacts on terrestrial ecosystems (including forests) that Parties had analysed in their assessments included: increased fire hazard, loss of moisture (LKA), shift in forest extent, and in types and loss of biodiversity (CRI, NER, THA), loss of fodder, increased incidence of mortality due to onset of diseases, and loss of food production.

Fisheries

201. A few countries examined impacts on fisheries as a part of their impact assessment relating to climate change and sea level rise. No common methodologies were used for this sector, and only qualitative considerations were presented.

202. The Parties indicated possible adverse effects on fisheries due to changes in temperature and salinity, and loss of productive habitat for many species due to sea level rise and associated flooding. The Republic of Korea, for example, expects the extinction of cold water fish in the Yellow Sea due to a rise in sea-water temperature. The effect on deep water fish is dependent on whether the temperature will change at great depths, which is still uncertain. Egypt mentioned that a slight to moderate sea level rise could be quite beneficial to fish production.

203. Four Parties (EGY, FSM, LBN, SYC) analysed how climate change might affect their fishery resources and its impact on fishing techniques, diet and nutrition.

Other sectors

204. Parties presented (table 17) their assessment of climate change impacts on other sectors, including human settlements and energy, biodiversity, wildlife and indigenous cultural life. In most cases, climate change and sea level rise, along with changes in marine and coastal ecosystems, were expected to have a negative impact on biodiversity and wildlife.

205. El Salvador presented an initial assessment of the consequences of a possible reduction in crop production on socio-economic characteristics, such as level of employment, population, health, imports and food prices.

B. Adaptation measures and response strategies

206. All Parties discussed adaptation options and measures. They strongly stated the need to adopt adaptation measures to minimize the effect of future climate change in the most important socio-economic sectors. Table 18 displays sectors for which adaptation was discussed, and indicates methods and summarizes the level of reporting by each Party. Most Parties described adaptation activities in terms of future programmes and ongoing research, listing possible adaptation options and needs to combat adverse effects of climate change. A few countries reported on adaptation analysis and presented ranked lists of measures.

207. No country reported on implementation of adaptation measures, although a number of Parties listed projects for adaptation (e.g. GHA, SYC). Armenia presented potential projects aimed at strengthening institutions for studying climate change impacts and two projects devoted to developing computer models for assessing vulnerability and adaptation in different sectors. El Salvador reported on the implementation of a project with the assistance of the United States Agency for International Development to repair damage caused by Hurricane Mitch. One part of the project concerns enhancing national capacity to minimize losses from disasters, and therefore enhancing the capacity to adapt to future climate change and climate variability. Lebanon listed a number of adaptation projects in the water resource, coastal zone and agriculture sectors. Jordan submitted a list of priority actions included in its National Environment Plan, with preliminary cost estimates. These actions include measures in the water resource and forest sectors that could be considered as adaptations to future climate change. The Federated States of Micronesia presented a number of projects on collecting data, establishing monitoring and conducting research for further evaluation of vulnerability and adaptation.

208. Six Parties (EGY, JOR, KAZ, LSO, NRU, PHL) reported on incorporating adaptation measures into their national action plans and/or national environmental action plans as a first step toward implementation of adaptation. Several Parties noted the existence of a number of legislative acts and development plans which, although not designed especially to adapt to climate change, could facilitate future adaptation.

209. No Party provided information on the impacts of response strategies.

Methods

210. Most Parties did not report on adaptation analysis per se; they either listed possible adaptation options and generally explored possible ways to adapt or stated their needs for adaptation (table 18). In some countries, adaptation measures and strategies were initially identified based on the vulnerability assessment. In others, the measures were derived from various sectoral consultations, as well as from a review of existing policies and measures.

211. Forty-two Parties reported on conducting adaptation analysis in agriculture, 40 Parties on water resources and 28 Parties reported on adaptation in coastal zones. Some Parties attempted to cost and/or measure the effectiveness and benefits of individual adaptation options. Five Parties (EGY, KAZ, PHL, URY, WSM) used an adaptation decision matrix (ADM) and/or adaptation strategy evaluator analysis (ASE) to evaluate and rank adaptation options in agriculture, water resources and coastal zones. Egypt also used the DSSAT model to assess and

rank adaptation options in agriculture. Grenada focused its adaptation analysis on the tourism sector, which is closely associated with its coastal zones and marine ecosystems.

212. Thirty-eight Parties provided a list of adaptation options which could be implemented if resources were made available and if their capacities allowed them to undertake these activities. Some Parties (AZE, CHL, EGY, KAZ, PHL, URY, WSM, ZWE) ranked their adaptation options based on methods such as cost-benefit analysis, adaptation strategy evaluator, adaptation decision matrix and decision support for agrotechnology transfer.

Results

213. Parties reported on specific adaptation options in five sectors. Presentation of the results varied from quantitative descriptions of the measures, including their costs and benefits, in text or tabular form, to a listing of the options and/or needs to adapt (table 18). Parties presented adaptation options in agriculture, water resources and coastal zones more extensively than in other sectors. Table 19 displays a summary of adaptation options in these sectors. These options have been identified by more than one country.

214. A number of Parties also listed general, cross-sectoral measures to enhance adaptive capacity and future adaptations. In most cases, Parties pointed out that adaptation options identified, especially in agriculture, water resources and coastal zone applications, essentially represented improved resource management, and would have benefits in dealing with current climatic stresses as well as with future climatic change impacts.

215. Forty-one Parties reported on adaptation possibilities in the agriculture sector. Some of them (table 18) specified the potential costs of such measures and criteria for selecting measures of adaptation in addition to costs. The Parties reported that adaptation in the agriculture sector is particularly important in order to protect the food base. Parties focused on measures to counteract reduced crop yields, so that in most cases their adaptation options were designed to offset negative impacts. The most commonly mentioned agricultural adaptation measures are listed in table 19.

216. The options reported in agriculture covered policy, technology and education. Among the measures most commonly mentioned by Parties were the following: measures focusing on adapting management practices to new climates (e.g. shifts to alternative planting dates, changes in fertilizer application, changed plant density), measures relating to the use or development of new and more resistant crops, and the introduction of different irrigation practices and special soil treatment (table 19).

217. Most Parties also identified options focusing on educational and outreach activities to facilitate adaptation, which provide actors with information about possible and current climate changes and encourage them to change practices and to switch to different cultivars. Other Parties referred to technological options for improving irrigation systems. Ten Parties mentioned policy options such as the imposition of standards, reforms in the agriculture sector, development of a free market and promotion of investment in farming. Twenty Parties mentioned the development of new crops, seven Parties mentioned the development of warning systems and disaster preparedness, and four countries indicated the establishment of seed banks and improvements in pest forecasting and control (table 19).

218. Among the measures evaluated, seed banks, which stock genetic material, were the most cost-effective options in Kazakhstan and Uruguay. The most feasible options for Egypt and the Philippines were the least-cost measures, such as switching or adjusting to crops and cultivars, soil improvement, or rain management. In contrast, the measures which require research and development of new systems, e.g. new drought-resistant or improved systems of water management for efficient or extended irrigation, might not be feasible without financial support from government and from external sources.

219. Forty Parties (table 18) discussed adaptation in the water resource sector, and three of these provided a cost assessment and/or ranking of adaptation options. The detailed description of water resources adaptation by the Parties reflects their emphasis on water management as a key area for adaptation in the future. Many Parties mentioned the uncertainties associated with climate change impacts on water resources. Nevertheless, they described adaptation options that might reduce the vulnerability of water resources to climate change as well as to current climate variability, regardless of the magnitude of future changes in runoff.

220. Twenty-nine Parties explored options for increasing domestic water supply. These options included the prospecting and extraction of underground water, increasing storage capacity by building reservoirs and dams, and improving water management. Egypt and the Federated States of Micronesia mentioned desalination of sea water. The majority of Parties highlighted the extraction of groundwater as the most cost-effective measure. The other measures identified on the supply side are potentially more expensive and can have adverse environmental impact. In addition, desalination requires a great amount of energy and might not be feasible and consistent with the abatement aims unless renewable sources of energy were used.

221. The Parties (table 19) also considered outreach and technological options to reduce demand for water. These options involved measures either to increase efficiency by recycling water or restructuring water networks, or to reduce water demand for irrigation by changing the cropping schedule.

222. Some Parties proposed measures to counter the increasing risks of floods and drought. These measures included research and outreach activities, such as improvement of monitoring and forecasting systems and promoting awareness of climate change impacts. Lesotho mentioned developing a national drought policy to mitigate the adverse impacts of periodic droughts. Parties found these options to be the most cost-effective.

223. Few Parties considered reducing water pollution as an option for adapting to climate change. Several countries had proposed changing water management policies to provide incentives to use water efficiently, or referred to the use of economic incentives through increasing the cost of water, taxes and subsidies. In addition, three Parties (LSO, PHL, SLV) reported on the need for institutional development relating to water management.

224. Twenty-eight Parties (table 18) discussed adaptation in coastal zones. Three Parties had evaluated the costs of adaptation measures for various scenarios of sea level rise, and had estimated the opportunity costs of undertaking no adaptation measures. Six of these Parties addressed the issue in general terms. Two island countries (COK, TUV) described their needs

relating to adaptation analysis. Ten Parties with long coastlines did not report on adaptation in this sector.

225. Table 19 summarizes the coastal adaptation options that the Parties listed or analysed in their communications. Twenty-two Parties reported on measures to protect coastal areas, particularly economically important areas, by constructing hard structures, for example seawalls or groynes, and/or by implementing soft measures, such as beach nourishment, to counteract coastal erosion. Four countries mentioned protection of coral reef and coastal zone ecosystems through the creation of protected areas, comprehensive waste management and utilizing traditional technologies to promote shoreline stabilization.

226. Accommodation measures, which imply adjusting to sea level rise, including land-use changes, development of new planning and investment requirements, and more generally integrated coastal zone management, were considered by fifteen Parties. Nine Parties considered retreat as a measure to adapt to sea level rise and changing climate conditions. Eighteen Parties mentioned research and monitoring as the most important measure for planning adaptation of the coastal ecosystems and coral reefs (table 19).

227. For those Parties that assessed and prioritized options, planning coastal development, including urban growth and legal development regulations, appeared to be the best option, followed by beach nourishment, integrated coastal zone management and land-use change.

228. Eleven Parties (table 18) considered adaptation options for forests and grasslands. No Party provided cost estimates or ranked options for adaptation in this sector.

229. Forest development and conservation were seen as very important to protect watersheds, combat desertification and land degradation, preserve species and sequester carbon. Related measures that were noted as adaptations included the following: the protection and rehabilitation of forests and grasslands under stress and inappropriate use; forest expansion, for example through plantations, and measures to combat mud torrents, forest fires, pests and diseases (ECU, ISR, LKA).

230. Four Parties highlighted the importance of preserving genetic diversity, exploring drought-tolerant ecotypes and establishing migration corridors for certain species. Monitoring of and research into terrestrial ecosystems, as well as the establishment of adequate environmental standards and management of forests, were mentioned by six Parties. A number of Parties mentioned the importance of improvements to, and/or proper implementation of, existing legislation and plans for forest and land conservation for future adaptation to climate change.

231. In addition to the above-mentioned sectors, some adaptation options were listed in the areas of human health, fisheries and freshwater systems, and in the domains of human settlements and energy (table 18). Uzbekistan and Turkmenistan also mentioned the potential drying-up of the Aral Sea, which is expected to be exacerbated by the adverse effects of climate change. They proposed several measures to reduce the negative impact of climate change and to stabilize the situation.

232. Adaptation in the human health sector, as listed by Parties, included measures rooted in the areas of living standards, education and sanitation, as well as in the health sector itself. Parties noted such general options as the improvement of socio-economic living standards, and

increases in the awareness of hygiene and of strategies that aid vector control. Specific health sector measures included vaccination and chemical prevention measures, and the monitoring of groups that are considered to be at risk especially in exposed areas. Most reporting Parties mentioned the importance of research in the area of human health vulnerability and adaptation to climate change.

233. In the fisheries sector, all reporting Parties highlighted the importance of data collection, monitoring and further research in order to improve understanding of the impacts and to develop appropriate adaptation options. Egypt also proposed that it would develop flood protection in freshwater systems, and build dykes to store water in the lakes to increase fish production.

234. In the energy and human settlements sector, Egypt mentioned the necessity for it to develop a strategy for the migration of at least two million people from the deltaic areas, due to expected inundation and loss of fertile land. Argentina noted the need for its energy sector to adapt to climate change.

235. Several Parties discussed "cross-sectoral" measures that would enhance adaptive capacity. Among these measures, the following were noted: the raising of socio-economic living standards, control of the demographic pattern, developing and implementing environmental legislation, integrating climate change concerns into national development plans and programmes, developing appropriate infrastructure to reduce vulnerability, enhancing awareness among both the population at large and policy makers in particular, regarding climate change impacts and adaptation, and promoting sustainable development.

C. Implementation capacity

236. The information reported by Parties in the area of vulnerability and adaptation demonstrated that there was adequate capacity to assess the impacts of climate change, and to some extent, to evaluate potential adaptive responses. Most countries (table 16) were able to develop scenarios and apply a variety of impact assessment methods and models in key sectors. Several Parties demonstrated a capability to conduct integrated vulnerability assessments using a variety of methods, including vulnerability indices. In addition, some countries used several methods to evaluate, quantify and rank adaptation options.

237. One of the most significant constraints on the assessment of vulnerability and adaptation in non-Annex I Parties is the lack of data available to meet the demands of the methodologies that apply to these assessments, as well as Parties' inability to conduct the type of vulnerability and adaptation assessments that would generate reliable results which could be incorporated into national planning processes. Data required as input to impact models and assessments are either not present (uncollected), inaccessible or inappropriate.

238. The lack of data arises because of inadequacies in data collection, monitoring and access to existing databases, and an incapacity to analyse, manipulate and improve quality assurance in some data sets. Therefore there is a need to enhance national expertise and institutional capacity to systematically collect, analyse and maintain appropriate data and databases, and to assess vulnerability and the economic and social costs of implementing adaptation measures.

239. Most Parties provided information on the institutional capacity to assess vulnerability and adaptation options, presenting lists of institutions involved in the work. The institutions include

a wide range of governmental, non-governmental, academic and private sector organizations coordinated by a leading national institution or ministry. All Parties reported that they had established national technical teams to conduct vulnerability and adaptation assessments. Twenty-two Parties also mentioned making special institutional arrangements to integrate climate change concerns into national development plans and legislation. Fifteen Parties mentioned developing national action plans to address climate change issues including adaptation needs.

240. Many Parties also noted the lack of appropriate institutions and infrastructures to conduct systematic data collection, poor coordination within and/or between the different government departments and agencies, the absence of universities and/or research centres in smaller, poorer countries, and in other cases where universities exist but are not necessarily engaged in vulnerability and adaptation assessment work.

241. Adaptation was identified as a major issue but most non-Annex I Parties presented only a list of possible adaptation options without evaluating, prioritizing or costing them in their national communications. Some Parties presented action plans to implement adaptation strategies. Information on adaptation options in agriculture, water resources and coastal zones was generally more detailed and included better management of resources, technological responses and development of research, monitoring and education, but information on options for other sectors was less detailed.

242. The integration of adaptation into long-term planning is clearly a next stage for almost all non-Annex I Parties. In some cases, adaptation options need to be considered at the regional level (international waters, for example) and in others, adaptation options need to be considered in a more general context including living standards, demography, legislation and sustainable development at the national level.

243. Many Parties have expressed the need for more work on integrated assessments, socio-economic assessments, identification of adaptation options and costing implications. Some Parties consider that, where possible, vulnerability and adaptation studies should be conducted at a regional or subregional level, particularly where a number of countries share natural resources such as coastlines and water resources within major catchments or river systems.

244. While case studies for selected sectors relating to the analysis of potential adaptation options were undertaken, there appears to be a lack of comprehensive studies on possible adaptation measures, especially assessment of the costs and benefits of concrete adaptation options and of the effectiveness of adaptation measures. The consideration of policies with which to implement such measures and the examination of possible implementation are also still in their infancy. No country reported on implementation of adaptation measures, although many Parties listed adaptation projects.

245. Most Parties reported on financial and technological needs for conducting vulnerability assessments and developing measures to adapt to the adverse impacts of climate change. Parties also identified the following priority sectors where assistance is necessary for the assessment of the impacts of climate change and adaptation options: agriculture and food security, water resources, coastal zones, human health, forestry and human settlements. The financial and technological needs lie mainly in four areas: methodology and further research, human resources

development, strengthening of institutions, and technology and information transfer and dissemination.

246. Reporting Parties provided a comprehensive list of needs relating to data, methodology and further research needed in the areas of vulnerability and adaptation. These included:

(a) Developing a new methodology and/or adapting existing methodologies to suit local conditions for impact and vulnerability assessments, such as developing regional climate change models or better regional climate change scenarios, incorporating local socio-economic data into vulnerability assessment;

(b) Adapting and applying methodologies and/or tools for assessing adaptation options to local conditions;

(c) Collecting data and establishing monitoring programmes, and regular updating of databases;

(d) Expanding the scope of national assessment to include new sectors and/or refining and expanding previous vulnerability and adaptation analysis. Most Parties stressed the need to strengthen these studies with integrated assessments, assessment of adaptive capacity to climate change and extreme events, and identification of conditions that enhance adaptive capacity;

(e) Strengthening the benefits of various adaptation options, including quantification of costs and benefits, in order to gain a better understanding of what responses to adopt.

247. Non-Annex I Parties have a general weakness in human resources and in their capacity to undertake vulnerability and adaptation assessments. These weaknesses include a lack of capacity in the use of impact models, including the ability to adapt models to suit national circumstances, the development and application of socio-economic scenarios, and in the collection, quality control, archiving, retrieval, preparation and analysis of data relating to natural resources and biophysical processes required for vulnerability and adaptation assessment.

248. Many Parties reported on their needs for capacity-building in the fields of technology, vulnerability and adaptation assessment, implementation of adaptation measures, and information exchange through the development and use of web sites and the establishment of national and regional information centres. They also stressed the need to support the enhancement of multidisciplinary technical expertise through adequate training programmes, national, regional and international workshops with the support and participation of international institutions.

249. Some Parties reported that they would need to develop adequate capacity to address climate change concerns related to water resources and coastal zone sectors. Other Parties also reported on the need to develop education and awareness-raising programmes, particularly among communities which are likely to be most seriously affected by impacts of climate change.

250. In the area of institutional strengthening, Parties indicated the need to enhance institutional capacity to develop and operate analytical models to assess more fully the vulnerability and the economic and social costs and benefits of the potential adaptation measures. Several Parties mentioned building national institutional capacity to ensure continuity of

activities undertaken under the national communication process. Parties also expressed a need to strengthen regional institutional networks to facilitate technology transfer in the area of adaptation, especially in the coastal zones, as well as the need for institutional arrangements to incorporate climate change concerns into legislation and national action plans.

251. The critical role and the needs of climate change coordinators in improving national communications have been recognized, particularly with regard to vulnerability and adaptation assessments. The needs identified include training and support for climate change coordinators to enable them to bring together the range of expertise required for conducting integrated assessments on a continuous basis, for making better use of local/regional expertise, research organizations and universities, and for training in the procedures of the GEF for the preparation of project proposals.

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

252. All reporting Parties have provided information on education, training and public awareness programmes in varying levels of detail. Parties expressed concern about the inadequacy of national programmes on education, training and public awareness relating to climate change for academic and research institutions, policy makers, practitioners in the media and industry, students and teachers in formal and non-formal educational systems, non-governmental and community-based organizations, and the public at large.

253. Education, training and public awareness issues were treated together most of the time, and the consideration of information on these issues in the national communications varied widely amongst Parties. Approximately half of the 52 Parties dedicated a separate chapter to these issues, while other Parties either included them as a section of a chapter or covered the issue very lightly within the national communication. In almost all cases it was very difficult to distinguish clearly between the ongoing activities and programmes from those which are yet to be implemented.

Education

254. Many Parties have indicated their intention to incorporate environmental and climate change issues into formal education systems. Twelve Parties detailed information on educational programmes initiated in the area of climate change, while others merely described their plans to incorporate the subject into formal education if appropriate expertise in this area were to be available.

255. Eleven Parties, however, stressed that they consider education on climate change to be an important part of their national development and environment plans. For instance, Israel reported on its current education programme on environmental studies for school levels ranging from kindergarten to secondary school, and Lesotho stressed the importance of climate change scholarship programmes. Some Parties also focused on educating local communities, the private sector, and government/professional personnel.

256. Many Parties have provided information on thematic lectures and courses they have organized on various aspects of climate change, while others have initiated institutional cooperation with universities and other tertiary institutions. Other Parties further indicated that

they had participated in international and/or regional educational programmes and workshops, had developed excellent teaching materials on the environment and/or climate change and had published their climate change studies. A number of Parties have yet to undertake some or all of these activities.

257. Seventeen Parties presented their existing and future plans for tertiary level education programmes aimed at specific technical elements, general awareness of climate change impacts, the integration of climate change issues into the curricula for environment, natural resource management and conservation, forestry, waste, energy and/or atmospheric studies.

258. The importance of the use of the expertise of local communities and collaboration with non-governmental organizations and the private sector in the preparation of climate change educational materials, and in promoting awareness, education and training, was recognized by many Parties.

259. The importance of incorporating the issue of climate change into primary and secondary education programmes by means of curricula reform was also emphasized by several Parties. Academic curricula on environment, energy and atmospheric studies have been revised in some countries to include elements of climate change.

260. Fifteen Parties indicated that they have prepared educational materials for government experts as well as awareness materials for the general public and for local communities. Others indicated their plans to undertake activities such as the creation of libraries and the granting of scholarships in support of their educational programmes.

Training

261. When reporting information on training, most Parties were not systematic enough in their reporting to enable a clear classification of concrete action and future needs. However, Parties referred to the training received for the preparation of initial communications and national GHG inventories (10 Parties), impacts and vulnerability assessments (11 Parties), adaptation (10 Parties) and identification of GHG mitigation options (nine Parties). Eleven Parties made reference to their participation in, and/or organization of, regional and international exchange programmes and workshops.

262. Training was mainly oriented towards government policy makers and national experts. Parties also mentioned that some training activities were aimed at specific sections of society such as the media, local communities, farmers and the business community. For instance, Costa Rica reported on projects to improve national capacity on environment-friendly issues, and Thailand reported that its students are trained through participation in workshops on the principles of environment and biodiversity conservation.

263. Many Parties also indicated that most of the training activities and workshops organized in the area of climate change were those which took place as part of activities relating to the preparation of their initial communications, particularly in the areas of GHG inventories, vulnerability and adaptation assessments and GHG abatement options.

264. Most Parties reported that their participation in, and/or organization of, regional and international exchange training programmes and workshops was extremely important. These

training activities were designed mainly for government policy makers and national experts and were rather limited in scope. Parties expressed the need, therefore, to provide training in specific technical and policy issues relating to climate change and sustainable development. Some Parties also indicated that they lacked the capacity to formulate climate change project proposals in the required format or to access bilateral and multilateral funds for project development and implementation.

265. Several Parties mentioned that they lacked sufficiently-trained scientific and technical personnel, as well as policy makers, in the field of climate change to carry out their obligations under the Convention effectively. A number of Parties also outlined their lack of institutions or the inability of existing institutions to carry out research and training on climate change issues in order to satisfy the reporting requirements of the UNFCCC and to improve understanding of local and regional climate change impacts.

266. Some Parties further mentioned that they lacked the institutional and technological capacity to assess public awareness needs relating to the causes and impacts of climate change and to the capacity to develop and implement relevant public awareness programmes and activities.

Public awareness

267. Several Parties noted that public awareness is an important means of disseminating information relating to climate change issues, and they expressed the view that this aspect has not been adequately addressed, especially in ongoing enabling activity projects. They stressed that raising the interest of the general public in climate change is a major challenge for most non-Annex I Parties. As a result of efforts at national and international levels to address this problem, awareness on environmental issues is gradually improving; the subject of climate change is still far, however, from being well understood by the general population.

268. The content of public awareness materials needed by developing country Parties varied widely, ranging from general information on environmental and climate change concerns to more specific information on vulnerability assessments, the benefits of certain GHG abatement and adaptation options, and energy and natural resources conservation. Most Parties indicated that public awareness activities initiated included the organization of workshops at national and regional level for information sharing, the presentation to the public of results on research studies, the organization of climate change awareness surveys, the establishment of national environmental information and/or training centres, as well as of national or regional information networks and/or clearing houses, and the dissemination of scientific, legal and technical information.

269. In some countries the dissemination of information for public awareness took place through diverse materials and means, including pamphlets, brochures, newsletters, articles in newspapers, the publication of studies, information kits, teaching materials, CD-ROMs, the Internet, audiovisual materials, radio, television, posters, exhibitions, and public talks and meetings (table 20).

270. Furthermore, many Parties indicated that they needed to ensure the active participation of major stakeholders, including non-governmental organizations, the private sector and

community-based organizations, in the formulation of strategies and the preparation of materials for raising public awareness of environmental and climate change issues.

271. Most of the awareness activities were targeted at the general public. Some Parties also reported on special awareness campaigns for specific groups such as local communities, government and industry officials, and professionals and/or experts. The collaboration of non-government organizations in public awareness campaigns was also mentioned by several Parties.

IX. FINANCIAL AND TECHNOLOGICAL NEEDS AND CONSTRAINTS

A. General financial, technological and capacity-building needs and constraints

General capacity-building needs

272. All reporting Parties expressed the need for capacity-building initiatives. The needs varied considerably amongst Parties. They ranged from very minor specific requests to broad and extensive ones. Most Parties expressed their need for capacity-building relating to data collection and management and archiving to facilitate the preparation of national communications and for addressing climate change issues. The needs were dictated by the specific circumstances of individual Parties and were very often related to capacity-building in the areas of human resources development, institutions, methodologies, technology and equipment, and information and networking.

273. Needs were specifically associated with a lack of capacity for the preparation of GHG inventories, assessments of impacts and vulnerability to climate change, and facilitating adaptation to the adverse effects of climate change, as well as the identification and implementation of measures for addressing climate change. Others related to more general capacities to prepare national plans and report other information in accordance with the implementation of the Convention. Few Parties requested assistance towards enhancing national capacities for better policy formulation and planning, or the integration of climate change issues into sustainable development, or the hosting of workshops for exchange of information and training.

General financial and technological needs and constraints

274. All Parties provided information on their financial and technological needs and constraints associated with the implementation of the Convention. Lack of access to, and in adequacy of, methodologies and tools as well as of reliable data were recurrent constraints reported by almost all Parties. A need for the promotion of information sharing and networking at the national, subregional, regional and international levels was stressed by some Parties.

275. Reporting Parties also expressed needs associated with a lack of capacity for the preparation of GHG inventories, for the assessments of impacts and vulnerability to climate change, and the identification and implementation of measures for addressing climate change.

276. Other needs of Parties relate to a lack of general capacities to prepare national climate change plans, and difficulties in reporting on other information relating to the implementation of the Convention. Many Parties reported that the climate scenarios developed using the currently

existing models were inappropriate. The need to promote education, training and public awareness, and research and systematic observation, were deemed essential by many Parties, while others identified the integration of climate change into national planning and policy-making towards sustainable development as an area of need.

277. The level of detail provided by each reporting Party in respect of its financial and technological needs varied considerably. Information in national communications relating to technological and financial needs were often not expressed explicitly and were sometimes presented as constraints within the various chapters of the communications. Eleven Parties dedicated a full chapter or section to their financial and technological needs and constraints. This facilitated the compilation and synthesis of information.

278. In accordance with Article 12.4 of the Convention and paragraph 17 of the UNFCCC guidelines, 27 Parties included project proposals for funding to abate GHG emissions. Three Parties (AZE, MUS, SLV) also included lists of adaptation projects for funding, while Ghana provided a list of adaptation projects along with associated cost estimates.

279. Most Parties acknowledged the financial and technical assistance received from the GEF and various bilateral programmes[26] towards producing their national communications. Many indicated a need for further financial and technical assistance, important for improving and maintaining national capacity to prepare and submit national communications as well as for other activities for implementing the Convention. The needs identified can be summarized as follows:

(a) Strengthening of the national institutional framework (climate change committees, technical and or expert teams, etc.) for undertaking tasks relating to the implementation of the Convention (29 Parties);

(b) Enhancing the national capacity for policy formulation and planning (12 Parties) and the integration of climate change considerations into multisectoral activities (AZE, BTN, JAM, LAO, SEN, TKM, VCT) to facilitate the attainment of sustainable development. Some Parties also stressed the need to improve national legislation (10 Parties);

(c) Strengthening national coordination, in particular through a more active role of national UNFCCC focal points or national authorities responsible for climate change activities, as well as enhancing participation, collaboration and exchanges within regional and international climate change programmes and activities (14 Parties);

(d) Enhancing technical capabilities, and improving infrastructure and equipment for better data collection and monitoring, to enable development and maintenance of proper databases (25 Parties). Seven Parties (COK, EGY, LBN, MUS, NRU, UZB, VUT) expressed the need to have access to satellite imagery data, while others wished to establish or upgrade stations for systematic observation of the climate system as well as to establish environmental monitoring systems (18 Parties) (table 21);

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[26] National communications made reference to the assistance received from the GEF through its implementing agencies (United Nations Environment Programme, United Nations Development Programme and the World Bank). Some Parties acknowledged the assistance provided by the National Communications Support Programme (GEF/UNDP/UNEP). Many also referred to assistance from bilateral programmes such as the United States Country Studies Program and the Netherlands and German cooperation agencies.

(e) Enhancing the analytical capacity of experts, policy makers and decision makers to better understand the linkages and interactions the exist between technical and political dimensions of climate change (22 Parties);

(f) Promoting the participation of key stakeholders, such as the public and private sectors, non-governmental organizations, academia, and scientific and technical personnel, as well as local communities (20 Parties);

(g) Raising public awareness and incorporating climate change issues into national formal educational systems at all levels in order to facilitate effective implementation of climate change measures (34 Parties);

280. Three Parties (EGY, URY, ZWE) stressed a need for the creation of multi-disciplinary education and training institutions dedicated exclusively to climate change. Six other Parties (ARM, COK, MEX, MYS, MUS, URY) also expressed the need to increase their opportunities and capabilities to host national technical events and workshops for the exchange of information and training on climate change.

281. Six Parties (CIV, DZA, IDN, SYC, TKM, UZB) emphasized the need to establish national and/or regional clearing houses for information sharing and networking on climate change issues.

B. National greenhouse gas inventories

282. Almost all non-Annex I Parties reported difficulties encountered in preparing their GHG inventories, and indicated that their technical and institutional capacities were inadequate to meet their obligations regarding the preparation and updating of GHG inventories. Constraints stemmed in many cases from a lack of quality data. The data were very often scanty or unreliable. Sometimes data exist but are not accessible or are too poorly organized to be useful.

283. Many Parties reported that the emission and conversion factors were not appropriate and applicable to their situation, and some Parties stressed the necessity to adapt the methodology for evaluating forests as sinks to suit their unique circumstances.

284. Most Parties expressed their financial and technological needs in order to ensure the continuous collection and archiving of data with a view to improving future inventories. This warranted the establishment and maintenance of stable national institutions such as inventory teams (DZA, ECU, LSO, MEX, PHL, SLV, URY). The improvement of infrastructure coupled with more efficient equipment and better facilities (11 Parties) would permit the creation and/or strengthening of statistical systems for managing basic information relating to GHG emissions (24 Parties). The need to establish a reliable and effective GHG inventory database system was also expressed by 16 Parties.

285. Financial and technical assistance is also needed for improving data quality (availability, accuracy and reliability) in various key socio-economic sectors, particularly in the land-use change and forestry sector. For many Parties, data are either lacking or highly uncertain (30 Parties). Specific needs relate to establishing systematic mechanisms to collect data, undertaking field studies and validation of default emission factors, carrying out further surveys in order to reduce uncertainties in economic forecasts, improving the use of methodologies to determine

forest area, improving institutional capacity to collect forest data, and formulating strategies to generate more resources for carbon sequestration studies.

286. Parties also expressed the need to improve the availability and reliability of data through active cooperation with relevant government departments and agencies, industry, non-governmental organizations and other sources of data. Access to adequate training was also considered to be an important element in enhancing local technical capacity and expertise in data collection, management and dissemination (17 Parties). Georgia, in addition, requested financial assistance for improving GHG emission projections while Algeria required the means to calculate the sink capacity of steppes.

287. The IPCC default emission factors for several source categories were found to be inappropriate by most Parties and they expressed a need for the development of appropriate emission factors for the respective sectors with a view to improving estimates of national GHG emissions (23 Parties). Parties emphasized, in particular, limitations relating to the applicability of the IPCC non-CO_2 emission factors and the need to study the composition of local fuel types, the development of specific emission factors for fugitive gases from oil fields and agricultural soils, and processes relating to the production of steel, iron and cement.

288. One Party (FSM) referred to the need to improve GHG inventory methodologies to suit local conditions, particularly as they relate to research on current and potential carbon sinks of coral reefs and marine ecosystems. Grenada expressed the need to develop emission factors in collaboration with other regional countries, in order to obtain annual production and consumption data on primary fuels.

289. El Salvador identified difficulties relating to the collection of solid waste information at the municipal level.

Implementation capacity

290. Egypt requested assistance to expand the scope of its original inventories by including other gases, namely nitrogen oxides, carbon monoxide, non-methane volatile organic compounds, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. It also indicated the need for a comprehensive study on measuring and monitoring methane emissions from exploitation, transmission and distribution in its petroleum sector.

291. Some Parties stressed the need to develop a comprehensive energy balance to help compute GHG emissions in the energy sector on a continuous basis. The Philippines requested assistance to link the energy balance with GHG emissions methodologies such that data changes in the energy balance are automatically reflected in the GHG emissions values. Mauritius called for better statistics and data gathering for periodic updating of GHG inventories, while Uruguay emphasized a need to determine national emission factors in the energy sector.

292. The Philippines indicated its lack of data on household consumption of biomass fuels (wood, wood waste, charcoal, agriwaste, etc.), and requested funds to conduct and update, on a more sustainable basis, studies on the consumption of conventional and non-conventional fuels.

293. A few Parties (ARG, MUS, PHL) outlined technological and financial difficulties encountered in collecting data in the transport sector for accurate estimates of vehicular emissions and in measuring and applying default values for data sets.

294. Three Parties (EGY, PHL, SLV) reported assistance needed to improve modelling of GHG emissions in the agriculture sector, especially for estimation of the carbon fraction in rice fields, and to undertake research studies on savannah burning. The Philippines expressed the need to generate data on crop residues to help estimate emissions from burning of agricultural residues.

295. Grenada expressed a need for the training of personnel in the compilation and analysis of GHG inventories as well as in order to keep abreast of refinements to the IPCC methodologies.

296. The Lao People's Democratic Republic and the Seychelles reported on institutional capacity-building needs to measure emissions and develop norms, as well as to address problems relating to the lack of appropriate activity data and emission factors. Seven Parties (BTN, CIV, COD, CPV, JAM, LKA, MLI) also expressed the need for support for research on emission factors and for obtaining relevant activity data. Niger and the Seychelles mentioned the need for GHG inventory workshops to help improve the expertise of national experts.

297. Bolivia indicated the need to improve knowledge on N_2O emissions and the estimation of GHG emissions in sectors such as land-use change and forestry and other specific sectors from the energy field. Ghana also has financial and technological needs in order to implement projects on land-use change and forestry for GHG emission abatement.

298. Honduras and the Seychelles expressed their need for financial assistance to help draft a new detailed forestry map, while Algeria expressed a need for financial assistance in obtaining data from the private sector on forestry data as well as in updating old forestry data sets.

299. The need to strengthen institutional capacities through training and technical support was expressed by three Parties (MHL, MYS, SYC). Mauritius and Honduras expressed the need to improve national policies based on statistics and data gathering for following up GHG inventories.

300. Turkmenistan expressed the need for an assessment of wind and solar energy resources in the region and the development of methods for economic assessment of projects on GHG emissions reduction.

C. Measures for addressing climate change

301. Most reporting Parties indicated their need for assistance in undertaking specific activities to identify and implement measures to address climate change (table 21). Access to adequate financial assistance is crucial to the development of an integrated GHG mitigation policy with well-defined sectoral strategies. Institutional capacity-building and effective coordination of government agencies were said to be important steps in further identifying and implementing viable mitigation options.

302. Several Parties also expressed the need to access appropriate technologies as well as to strengthen regional networks which would help to facilitate technology transfer and adoption.

The setting up of a network for information sharing, dissemination, training and education was deemed necessary. Funding of research activities in the different sectors is a must to provide the necessary information on measures to be implemented.

303. Almost all Parties stressed the need to develop methodologies for determining and/or monitoring more precisely the potential of sinks, as well as a need to undertake studies on sink capacities, in particular on carbon sequestration capacity.

304. Many Parties expressed a need to access financial and technological resources in relation to the energy sector. Three Parties (JOR, LBN, MUS) stressed the need for access to information, awareness creation for decision makers, development of an institutional framework, including legislation, and human resources development (LBN).

305. Needs relating to the promotion of renewable energy were identified by many Parties. These include access to affordable technologies for power production with renewable resources (PHL), the removal of barriers to rural electrification projects using renewable energy sources (CHL, GHA), the promotion of hybrid renewable energy projects (IDN), and the construction of small hydro plants (KAZ). Other Parties needed access to and development of solar and/or wind energy (KIR, MYS, MUS, SYC), the sensitization of stakeholders to the use of more efficient and cleaner production systems (LBN, MUS), and the development of inventories of renewable energy sources (TKM, UZB).

306. Many Parties pointed out the need to obtain energy management support to improve energy efficiency. A wide range of energy efficiency measures were identified, including assessment of the electricity generation system with regard to optimal efficiency, taking into account different types of generators and cable distribution (KIR), the development of cogeneration technology using the combined heat and power cycle, and improvements to the heat transfer operations of fossil fuel power plants as well as steam and gas power plants (KAZ). Other measures included were: promoting building insulation (KAZ, LBN), replacing old electric motors by energy efficient ones (LBN), replacing old boilers and furnaces (LBN), promoting energy efficient stoves and biogas digesters (ZWE), and promoting more efficient energy use through public awareness and legislation (MYS).

307. A few Parties (JOR, KAZ, LBN, URY, ZWE) also emphasized their needs in the industry sector for reducing energy losses from major industrial establishments (oil refineries, cement factories) and improving awareness of and upgrading training in energy savings for decision makers in energy-intensive industries.

308. Indonesia identified a need for assistance to strengthen research work on sustainable agricultural practices and to provide training and education in higher institutions. It also stressed that although local communities have the expertise to deal with forest fires, they lack the resources, and training in this area should also be supported.

309. Other needs were related to economic assessment of projects on GHG emissions reduction (TKM), the availability of decision tools, and education and sensitization of the public (DZA).

Implementation capacity

310. Egypt and Mauritius requested financial support to promote educational campaigns on the safe handling and treatment of solid and liquid waste.

311. Five Parties (ARG, EGY, GHA, MUS, URY) requested financial assistance to implement a number of measures in the transport sector. These included infrastructural improvement for public transport, use of electric-powered and fuel-efficient vehicles, incentives for car pooling, imposition of speed limits, introduction of efficient fuels, and educational programmes to encourage the use of public transport.

312. A few Parties (IDN, MEX, SYC, TKM, URY, UZB) requested assistance to help build capacity to formulate mitigation projects for funding and to provide information on incremental costs and economic assessment of mitigation projects.

313. Grenada needs access to the range of available technologies for increasing energy efficiency, the use of non-fossil fuel as energy sources, and implementing demand side management strategies in order to mitigate increases in GHG emissions. Three Parties (ARM, AZE, KAZ) indicated that additional financial assistance would be necessary for implementing voluntary commitments to reduce GHG emissions.

314. Five Parties (BOL, HND, LKA, MLI, NER) broadly presented their need for financial assistance to deal with mitigation and enabling activities, and the Lao People's Democratic Republic expressed its need for funds for preparing projects on mitigation and climate change enabling activities. Two Parties (MHL, VCT) focused on enabling activities and appropriate information management systems for spectral and other data generated through different measuring and analysis activities.

315. Cape Verde stated that development and implementation of the national mitigation plan require technical and financial resources. Specific needs were expressed for training, database establishment, institutional capacity development and technology transfer.

316. Costa Rica requested technical and financial support to develop the potential of clean technologies and to carry out some enabling activities, while Jamaica's requirements were for institutions to train personnel who could formulate and implement policies and measures effectively.

317. Honduras expects assistance to complete studies to determine soil capacity at national level and to use such information in all projects supporting the mitigation of damage to natural resources.

318. Bhutan expressed the need for financial and technical assistance for instituting measures to address global environment issues, hydropower accessibility and the drawing up of a power master plan.

319. Ghana stressed the need for funding to develop strategies leading to energy conservation, the promotion of energy-efficient equipment, the use of renewable energy sources, a switch from fossil fuel to LPG, the monitoring, control and reduction of emissions in the energy and transportation sector, and the enhancement of sink capacity.

320. Indonesia requested financial assistance to strengthen research on the development of sustainable agricultural practices, to provide training and education in higher institutions, and to deal with forest fires.

D. Assessment of vulnerability to climate change

321. Almost all reporting Parties encountered various problems and constraints in their efforts to complete vulnerability assessments initiated in preparing the initial national communications. In many cases the assessments were not very exhaustive and did not cover all sectors due to various reasons, including a lack of capacity and of good quality data as well as a lack of financial resources. Numerous assessments were qualitative, according to expert judgement, instead of quantitative studies. Assistance would be needed to undertake studies in sectors dealt with qualitatively only, and in those not covered in previous work (table 19). One of the basic needs for achieving this objective is capacity-building. This should enable Parties to use and improve climate impact models and to promote education and training. Other needs relate to capacity to collect and update relevant information, including data, to undertake long-term monitoring activities and to enhance research and systematic observation in relation to vulnerable sectors.

322. Many Parties outlined problems in developing climate change scenarios for assessing the vulnerability of different sectors to climate change. One of the major areas of concern is related to the use of general circulation models and impact assessment models, especially for the water resources, agriculture and coastal zone sectors.

323. Some small island States requested assistance for research on predictive modelling to generate improved scenarios for better vulnerability assessments. Three Parties (MEX, PHL, WSM) stressed that the definition of space and scope of GCMs limit their local and regional use.

324. Four Parties (CHL, SLV, SYC, VUT) mentioned a need for assistance to undertake or further improve socio-economic scenarios. Algeria and Vanuatu mentioned, in particular, their need to integrate climate change impacts and concerns into the broader context of social development priorities.

325. Five Parties referred to the need for financial assistance to help improve the development of sea level rise scenarios and monitoring and to adapt models to local conditions (FSM, MYS, PHL, VUT, WSM).

326. Six Parties (DZA, EGY, TKM, TUV, UZB, VUT) stressed, in addition, the need for enhancing existing methodologies and their capacities to undertake integrated assessment of climate change impacts in different sectors (such as water resources, agriculture and human health or coastal zones, human settlements and biodiversity).

327. A few Parties were concerned about the negative impacts of climate change on human health, especially vector-borne diseases. Seven Parties (COK, FSM, LSO, PHL, SLV, VUT, WSM) indicated a need for assessing the relationships between climate change impacts, impacts of extreme events and climatic variability events (El Niño, storm surges, strong winds due to tropical cyclones, etc.) including changes in their frequency and intensity.

328. Samoa pointed to a need to improve regional information on future climate and sea level changes, and the cumulative and indirect effects of such changes and to the need to further evaluate coastal erosion processes and land at risk from flooding and inundation. Ghana pointed out the inadequacy and ineffective implementation of existing legislation and regulations that impact on the coastal zones, and proposed a community-based approach. The Seychelles is concerned about the fisheries sector, and Algeria about desertification.

329. The development of capacity to undertake assessments in the area of water resources was underlined by a majority of Parties. Specific needs included: capacity to link climate change impact models to hydrological models and to adapt them to local conditions (DZA, EGY, GHA, PHL), study and assessment of water intrusion (EGY), enlargement of the coverage of assessment of the major reservoirs and river basins (AZE, EGY, GHA, JOR, KAZ, PHL), measurement, mapping and computer modelling of groundwater lenses (MUS, PHL), and establishment of databases for different reservoirs (GHA, PHL). Other needs included assessment of the impact of climate change on water consumption and water users in the domestic, industrial and agricultural sectors (GHA, PHL, SYC), studies into variations in temperature and quality of surface and groundwater (PHL), and the development of a regional integrated information exchange system for water resources (UZB), an inventory of water resources and projections of supply and demand (GHA), and assessment at country and regional level (TKM).

330. Parties presented various requests on financial and training needs for research and observation of vulnerability to climate change impacts in coastal zones. Funding was requested for regular monitoring of topographic information such as changes in coastline, salinity intrusion, and changes in morphological processes and ecological systems, namely coral reef reactions to warmer temperature (CPV, DZA, MUS, PHL, SEN, SYC). Further studies will also be required to evaluate impacts on natural resources in coastal zones, such as sensitivity of coral reef ecosystems to climatic and non-climatic changes (URY, WSM). Malaysia requested assistance for the development of a coastal vulnerability index and the Seychelles for the monitoring of the impact of climate change on fish stocks.

331. With regard to the agriculture sector, many Parties expressed their need for assistance with capacity-building to enable the relevant research to be conducted. Financial assistance was further requested to assess the vulnerability of a broader range of crops and livestock (DZA, MUS, PHL, WSM), the effects on soil fertility (PHL), agricultural productivity of different crop varieties, the incidence of livestock vector-borne diseases, the impacts of changes in water supply (PHL, VUT, WSM), and the experiments in breeding early maturing varieties of maize and sorghum that are tolerant to heat and water stress (GHA). Financial and technological assistance was also requested for the collection of agricultural data for use in models (DZA, GHA, MUS) for a better understanding of the effect of climate change on crops.

332. Financial assistance was also requested to undertake studies on the impacts of climate change on human settlements and populations. These studies included cross-cutting impacts of coastal zone changes on population and human settlements (PHL), assessment of the vulnerability of communities, and the optimum human population which small island developing countries can support while maintaining sustainable development (TUV, VUT). The need for

funding for further assessment of impacts on human health was also stressed by five Parties (DZA, MYS, PHL, WSM, ZWE).

333. Mauritius also mentioned the need for equipment and infrastructure to allow for the acquisition of regular aerial photographs and an increased use of geographic information system (computer mapping) software.

334. Three Parties (BTN, BOL, THA) mentioned their need for resources to improve the construction of climate scenarios at an appropriate scale and to carry out very specific research to assess the vulnerability of ecosystems to climate change. Training in scenario development and sectoral models in order to strengthen national expertise were needed in Mali, as well as the creation of a network to monitor the evolution of key climate parameters relating to sensitive sectors.

335. Honduras expressed a need for financial resources to correct drainage courses in mid and high basins and in valleys to reduce hydrological and geomorphological risks resulting from the passage of hurricane Mitch.

336. Niger requested training in climate variability and climate change issues through vulnerability workshops. Technical assistance for vulnerability assessment, mainly the impacts of climate change on the environment, natural resources and agriculture was also an identified need, as well as technical assistance in the use of models and other analysis tools.

E. Measures to facilitate adaptation

337. Most Parties reported financial and technological needs which varied considerably in relation to the constraints encountered in identifying, evaluating or implementing measures to adapt to the adverse impacts of climate change. Improving and completing vulnerability assessments was considered by most Parties to be a basic step towards identifying and implementing adaptation options.

338. Regarding vulnerability studies, Parties expressed the need to complement qualitative assessments with some quantitative analysis along with research on the socio-economic aspects. Institutional capacity-building is thus a prerequisite to enable proper research and systematic observation as a result of which the best options can be chosen. Adaptation assessment needs were often presented at the same time as those relating to vulnerability assessment.

339. Several Parties further stressed that financial assistance is required to improve information sharing, education and training, along with technical and scientific research, which are essential in order to achieve a well-balanced adaptation plan. Parties also emphasized the need to access adequate technology and to ensure the participation of local stakeholders in planning for adaptation. For many Parties, the adaptation options can be implemented only with the required financial and technical support.

340. Almost all Parties possessing a coastal zone identified the need for assistance to conduct or implement adaptation measures in those areas. Most Parties presented such a need for the water resources and agriculture sectors also. Five Parties (FSM, LSO, PHL, SLV, WSM) further reiterated the need to improve understanding of the relation of climate change impacts to those of extreme events in order to ensure preparedness, in particular with regard to infrastructure, human

health and agriculture. Other areas where Parties have identified adaptation options which also need support are human health, land-use change and forestry, biodiversity, ecosystems, fisheries and cross-sectoral evaluation.

341. Most Parties requested financial or technological support or both for conducting an improved adaptation assessment and to implement some of the options identified. Nine Parties (COD, HND, JAM, LKA, MLI, MHL, NER, THA, VCT) reported on their general need of support for adaptation projects in different sectors. Other broad requests from Parties are as follows: Cape Verde identified a need for adaptation technology; the Lao People's Democratic Republic and Grenada required assistance in developing their adaptation strategies. Bhutan and Thailand requested capacity-building for cross-sectoral adaptation measures and undertaking research and development on adaptation options for various sectors.

342. Funding to conduct additional research and to improve modelling would be necessary to further analyse, prioritize and define national adaptation options on water resources (16 Parties). Increased capacity to plan and manage water supplies would enhance adaptation measures to mitigate climate change impacts on water resources (HDN, KIR, SLV, TKM, TUV), and on demand in the case of Ghana.

343. Parties also emphasized the need for funding and technology to undertake a number of specific measures, such as managing the use of waste-water (KAZ), constructing household back-up rain catchment tanks (MUS), improving waste-water management (EGY, MUS, TUV), and establishing a data system and procedures for water management decision-making and coordination (SLV).

344. Parties mentioned a number of adaptive options in the agriculture sector requiring further financial and technological resources. A wide range of specific research needs was identified, such as the effect of CO_2 fertilization on crop growth (ISR, MUS, PHL, SEN), genetic improvement of crops (GHA, MUS), effects of microorganisms on soil processes (MUS), modelling of vegetation-climate interactions (GHA, MUS), analysis of crop and animal production (MUS, WSM), and assessment of optimal varieties of crops (GHA, MUS, WSM).

345. Bolivia and Niger identified a need for research into developing more resistant pastures. The Philippines stressed the need for improving land use policy to help farmers adopt adaptation measures and in the process gain access to modern technology. It also outlined its need for resources to promote adaptive options in agriculture that could also be beneficial for mitigation purposes.

346. Assistance will be required by most Parties having a coastal zone to enhance national capacity and infrastructure for planning for integrated coastal zone management while taking into account additional impacts on human settlements, fisheries and infrastructure, and possible economic impacts (14 Parties).

347. Parties also mentioned the need to undertake more research into response measures to impacts on coral reefs, such as by assessing the effect of sewage (FSM, MUS). More reliable contour data of coastal zones is needed for better identification of risk-prone areas and thus formulation of the best adaptation options (GHA, SYC).

Table 1: Status of reporting of inventory data

Party	Method used	Years	Reporting table[a]	Precursors: CO, NOx, NMVOC	HFCs, PFCs, SF_6	SO_2	Bunkers	CO_2 equivalent estimates
Algeria	IPCC, 1996	1994	IPCC Summary	X	X (HFCs, PFCs)	x	x	x
Argentina	IPCC, 1996	1990, 1994, 1997	IPCC Summary	X	X b	X	X	X
Armenia	IPCC	1990	IPCC Summary	X	-	-	X	X
Azerbaijan	IPCC	From 1990 to 1994	Table II (+ waste)	X	-	X	X	X
Bhutan	IPCC, 1996	1994	Table II (+ waste)	X	-	X	-	-
Bolivia	IPCC, 1996	1990, 1994e	IPCC Summary	X	X (HFCs only)	X	X	X
Cape Verde	IPCC, 1996	1995	IPCC Summary	CO, NOx only	-	-	-	X c
Chile	IPCC, 1996	1994	IPCC Summary	X	-	X	-	X c
Cook Islands	IPCC, 1996	1994	Table II	-	-	-	X	X (some only)
Costa Rica	IPCC, 1996	1990, 1996	IPCC Summary (7B)	X	X (HFCs only)	X	-	X
Côte d'Ivoire	IPCC, 1996	1994	IPCC Summary	X	-	-	X	X
Democratic Republic of Congo	IPCC, 1996	1994	IPCC Summary	X	-	X	-	X
Ecuador	-	1990	IPCC Summary	X	-	-	-	X
Egypt	IPCC	1990/91	IPCC Summary	-	-	-	X	X
El Salvador	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	-	X
Georgia	IPCC,1996	From 1990 to 1997	Table II	X	-	X	-	X
Ghana	IPCC, 1996	From 1990 to 1996	IPCC Summary	-	-	-	X i	X
Grenada	IPCC, 1996	1994	Table II	NMVOC only	-	-	-	-
Honduras	IPCC,1996	1995	IPCC Summary (7B)	X	-	X	X	X
Indonesia	IPCC,1996	From 1990 to 1994	IPCC Summary	X	-		X	X
Israel	IPCC, 1996	1996	IPCC Summary	X	-	X	X	X
Jamaica	IPCC, 1996	1994	Table II	X	-	X	-	-
Jordan	IPCC	1994	Table II (+ waste)	X	-	-	X	-
Kazakhstan	IPCC	1990, 1994	IPCC Summary	X	-	-	-	X
Kiribati	IPCC	1990, 1994 (only tables for 1994)	IPCC Summary	CO, NOx only	-	-	-	-
Lao People's Democratic Republic	IPCC, 1996	1990	IPCC Summary	CO, NOx only	-	-	-	-
Lebanon	IPCC,1996	1994	IPCC Summary	X	X (HFCs only)	X	X	X
Lesotho	IPCC, 1996	1994	IPCC Summary	X	-	-	-	X c
Malaysia	IPCC 1995	1994	Table II (+waste)	-	-	-	X	X
Mali	IPCC, 1996	1995	IPCC Summary	X	-	X	-	X

Table 1 *(continuation)*

Party	Method used	Years	Reporting table[a]	Precursors: CO, NOx, NMVOC	HFCs, PFCs, SF_6	SO_2	Bunkers	CO_2 equivalent estimates
Marshall Islands[f]	IPCC, 1996	1994	-	-	-	-	-	-
Mauritius	IPCC,1996	1995	IPCC Summary	X	-	X	X	-
Mexico	IPCC	1990	IPCC Summary	X	-	-	-	-
Federated States of Micronesia	IPCC, 1996	1994	Table II (+ waste) + IPCC Summary	X	-	X	-	-
Nauru	IPCC, 1996	1994	Table II	-		-	Xd	X
Niger	IPCC, 1996	1990, 1994, 1997	IPCC Summary	X	-	X	-	X h
Philippines	IPCC, 1996	1994	IPCC Summary	X	-	X	-	X
Republic of Korea	IPCC	From 1989 to 1995	IPCC Summary	X		-	X	X
Republic of Moldova	IPCC 1995 + CORINAIR	From 1990 to 1998	IPCC Summary	X		X	X	X
Samoa	IPCC, 1996	1994	Table II (+ waste)	X	-	-	-	-
Senegal	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	X	X
Seychelles	IPCC, 1996	1995	IPCC Summary	X	-	-	X	-
Singapore	IPCC, 1996	1994	Table II (+ waste)	-	-	-	X	X
Sri Lanka	IPCC, 1996	1993, 1994, 1995	IPCC Summary	X	X (SF_6 only)	X	X	-
St. Vincent and the Grenadines	IPCC, 1996	1990, 1994, 1997	IPCC Summary (7B)	X	-	X	X	-
Thailand[g]	IPCC, 1996	1994	IPCC Summary	X	-	-	-	X
Turkmenistan	IPCC, 1996	1994	IPCC Summary	X	-	X	X	X
Tuvalu	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	-	-
Uruguay	IPCC, 1996	1990, 1994, 1998	IPCC Summary	X	-	X	X	X
Uzbekistan	IPCC, 1996	1990, 1994	IPCC Summary	X	-	X	X	X
Vanuatu	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	X (aviation only)	-
Zimbabwe	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	-	X

Notes:

[a] IPCC Summary refers to the IPCC Summary table 7A or a similar breakdown of information. "Table II" refers to table II of the UNFCCC guidelines for the reporting of inventory data.

[b] Argentina included HFC emissions in its 1997 inventory.

[c] Cape Verde, Chile and Lesotho did not use the latest global warming potential (GWP) recommended by the IPCC.

[d] Nauru reported all aviation fuel under international bunkers.

[e] Bolivia has also officially submitted its 1990 national GHG inventory.

[f] Marshall Islands did not provide any national GHG inventory table.

[g] The 1989 and 1990 Thailand national GHG inventories were mentioned but not described in detail in the First National Communication.

[h] Niger indicated having calculated emissions from 1990 to 1997, but provided data for only 1990, 1994 and 1997. The Party reported all the emissions in CO_2 equivalent without any indication of the GWP used.

[i] The emissions from international bunkers from Ghana were calculated, but appear only in the electronic version of the annex to the national communication.

Table 2. Completeness of reporting according to the IPCC Guidelines, excluding small island developing States

GHG source category	CO_2		CH_4		N_2O	
	Reporting Parties	Percentage of total	Reporting Parties	Percentage of total	Reporting Parties	Percentage of total
I.A. Fuel combustion	**37** [c]	**100** *(100)*	**34** [a, c]	**92** *(100)*	34 [c]	**92** *(100)*
1. Energy industries	**32** [c]	**86** *(100)*	26 [a, c]	70 *(96)*	22 [c]	59 *(96)*
2. Manufacturing industries and construction	**31**	**84** *(96)*	25 [c]	68 *(96)*	22	59 *(96)*
3. Transport	**33**	**89** *(100)*	**30** [c]	**81** *(100)*	29	78 *(100)*
4. Small combustion	**31**	**84** *(100)*	29 [c]	78 *(100)*	23	62 *(100)*
5. Other	19 [c]	51 *(48)*	12 [a, c]	32 *(41)*	11 [c]	30 *(33)*
6. Biomass burning	20	54 *(93)*	15	41 *(4)*	13	35 *(4)*
I.B. Fugitive fuel emissions	5 [d]	14 *(63)*	25	68 *(96)*	1	3 *(26)*
1. Solid fuels	2	5 *(19)*	17	46 *(74)*	1	3 *(4)*
2. Oil and natural gas	5 [d]	14 *(56)*	25	68 *(95)*	1	3 *(22)*
II. Industrial processes	**36**	**97** *(96)*	14	38 *(67)*	12	32 *(81)*
A. Mineral products	**36**	**97** *(100)*	1	2 *(100)*	1	2 *(100)*
B. Chemical industry	14	38 *(63)*	9	24 *(59)*	9	24 *(78)*
C. Metal production	18	49 *(70)*	3	8 *(37)*	-	- *(11)*
D. Other production	5	14 *(22)*	5	14 *(4)*	2	5 *(4)*
III. Solvent use	1	3 *(56)*	-	- *(-)*	-	- *(37)*
IV. Agriculture	2	5 *(11)*	**36**	**97** *(100)*	34	**92** *(96)*
A. Enteric fermentation	1	3 *(-)*	**36**	**97** *(100)*	2	5 *(4)*
B. Manure management	-	- *(-)*	**34**	**92** *(100)*	17	46 *(85)*
C. Rice cultivation	1	3 *(-)*	27	73 *(33)*	1	3 *(4)*
D. Agricultural soils	2	5 *(19)*	1	3 *(15)*	31	**84** *(96)*
E. Prescribed burning of savannahs	1	3 *(-)*	17	46 *(4)*	14	38 *(4)*
F. Field burning of agricultural residues	2	5 *(-)*	**30**	**81** *(37)*	28	76 *(33)*
G. Other	-	- *(-)*	2	5 *(-)*	1	3 *(-)*
V. Land-use change and forestry	**36** [c]	**97** *(85)*	23	62 *(33)*	23	62 *(37)*
A. Changes in forest and other woody biomass stock	**36** [c]	**97** *(96)*	-	- *(-)*	-	- *(-)*
B. Forest and grassland conversion	**33** [c]	**89** *(33)*	20	54 *(26)*	21	57 *(26)*
C. Abandonment of managed lands	23 [c]	62 *(19)*	-	- *(-)*	-	- *(-)*
D. CO_2 emissions and removals from soils	10	27 *(33)*	-	- *(-)*	-	- *(-)*
E. Other	2	5 *(7)*	1	3 *(22)*	-	- *(26)*
VI. Waste	3	8 *(59)*	**35**	**95** *(100)*	11	30 *(70)*
A. Solid waste disposal on land	-	- *(15)*	**35** [c]	**95** *(100)*	3	8 *(4)*
B. Waste-water handling	-	- *(4)*	**34**	**92** *(85)*	9	24 *(59)*
C. Waste incineration	2	5 *(52)*	1	3 *(41)*	2	5 *(41)*
D. Other	-	- *(4)*	1	3 *(26)*	2	5 *(4)*
VII. Other	-	- *(7)*	-	- *(7)*	1	3 *(4)*
International bunker	22 [a, b]	59 *(93)*	7 [b]	19 *(63)*	9 [b]	24 *(67)*

Notes

The values given in bold face indicate that the percentage of reporting by non-Annex I Parties is equal to or higher than 80. The values given in italics and in parentheses indicate the percentage of reporting by Annex I Parties, for purposes of comparison. These values are taken from the summary tables of the common reporting format (CRF) 2001 submissions for the year 1999. In some instances Parties have reported non-numerical indicators, such as NE (not estimated), NO (not occurring), NA (not applicable), IE (included elsewhere), and C (confidential), which were taken into account here.

Sources reported as NO were considered as reported in this table. Sources reported as NE or NA were not considered as reported.

[a] Nauru treated all aviation fuel as international bunkers.

[b] Vanuatu reported only fuel for aircraft.

[c] Turkmenistan provided contradictory information.

[d] CO_2 emissions correspond to natural gas flaring in hydrocarbon fields.

[e] Mali and Niger did not always use the IPCC terminology.

Table 3. Completeness of reporting according to the IPCC Guidelines

GHG source category	CO_2		CH_4		N_2O	
	Reporting Parties	Percentage of total	Reporting Parties	Percentage of total	Reporting Parties	Percentage of total
I.A. Fuel combustion	**51** [c]	**98** *(100)*	**45** [c, e]	**87** *(100)*	**45**	**87** *(100)*
1. Energy industries	**42** [c]	**81** *(100)*	33 [c, b]	63 *(96)*	33 [c]	63 *(96)*
2. Manufacturing industries and construction	41	79 *(96)*	29 [c]	56 *(96)*	24	46 *(96)*
3. Transport	**45**	**87** *(100)*	36 [c]	69 *(100)*	35	67 *(100)*
4. Small combustion	**43**	**83** *(100)*	35 [c]	67 *(100)*	29	56 *(100)*
5. Other	19 [c]	37 *(48)*	12 [c, e]	23 *(41)*	11 [c]	21 *(33)*
6. Biomass burning	21	40 *(93)*	18	35 *(4)*	16	31 *(4)*
I.B. Fugitive fuel emissions	5 [d]	10 *(63)*	26	50 *(96)*	1	2 *(26)*
1. Solid fuels	2	4 *(19)*	17	33 *(74)*	1	2 *(4)*
2. Oil and natural gas	5 [d]	10 *(56)*	26	50 *(93)*	1	2 *(22)*
II. Industrial processes	40	77 *(96)*	14	27 *(67)*	12	23 *(81)*
A. Mineral products	39	75 *(96)*	1	2 *(11)*	1	2 *(4)*
B. Chemical industry	14	27 *(63)*	9	17 *(59)*	9	17 *(78)*
C. Metal production	18	35 *(70)*	3	6 *(37)*	-	- *(11)*
D. Other production	5	10 *(22)*	5	10 *(4)*	2	4 *(4)*
III. Solvent use	2	4 *(56)*	-	- *(-)*	-	- *(37)*
IV. Agriculture	3	6 *(11)*	**48**	**92** *(100)*	**40**	**81** *(96)*
A. Enteric fermentation	1	2 *(-)*	**49**	**94** *(100)*	2 [c]	4 *(4)*
B. Manure management	-	- *(-)*	41	79 *(100)*	19 [c]	37 *(85)*
C. Rice cultivation	1	2 *(-)*	27	52 *(83)*	1	2 *(4)*
D. Agricultural soils	2	4 *(19)*	1	2 *(15)*	37	71 *(96)*
E. Prescribed burning of savannahs	1	2 *(-)*	19	37 *(4)*	15	29 *(4)*
F. Field burning of agricultural residues	2	4 *(-)*	31	60 *(37)*	29	56 *(33)*
G. Other	-	-	2	4 *(-)*	1	2 *(-)*
V. Land-use change and forestry	**48** [c]	**92** *(85)*	25	48 *(33)*	25	48 *(37)*
A. Changes in forest and other woody biomass stock	**43** [c]	**83** *(96)*	-	- *(-)*	-	- *(-)*
B. Forest and grassland conversion	35 [c]	67 *(33)*	21	40 *(26)*	22	42 *(26)*
C. Abandonment of managed lands	24 [c]	46 *(19)*	-	- *(-)*	-	- *(-)*
D. CO_2 emissions and removals from soils	11	21 *(33)*	-	- *(-)*	-	- *(-)*
E. Other	2	4 *(7)*	1	2 *(22)*	-	- *(26)*
VI. Waste	4	11 *(59)*	**46**	**88** *(100)*	18	35 *(70)*
A. Solid waste disposal on land	-	- *(15)*	**46** [c]	**88** *(100)*	3	6 *(4)*
B. Waste-water handling	-	- *(4)*	38	73 *(89)*	14	27 *(59)*
C. Waste incineration	3	6 *(52)*	1	2 *(41)*	2	4 *(41)*
D. Other	-	- *(4)*	1	2 *(26)*	2	4 *(4)*
VII. Other	-	- *(7)*	-	- *(7)*	1	2 *(4)*
International bunker	28 [a, b]	54 *(93)*	9 [b]	17 *(63)*	11 [b]	21 *(67)*

Notes:

The values given in bold indicate that the percentage of reporting by non-Annex I Parties is equal to or higher than 80. The values given in italics and in parentheses indicate the percentage of reporting by Annex I Parties, for purposes of comparison. These values are taken from the summary tables of the CRF 2001 submissions for the year 1999. In some instances Parties have reported non-numerical indicators, such as NE (not estimated), NO (not occurring), NA (not applicable), IE (included elsewhere), and C (confidential), which were taken into account here.

Sources reported as NO were considered as reported in this table. Sources reported as NE or NA were not considered as reported.

[a] Nauru treated all aviation fuel as international bunkers.

[b] Vanuatu reported only fuel for aircraft.

[c] Turkmenistan provided contradictory information.

[d] CO_2 emissions correspond to natural gas flaring in hydrocarbon fields.

[e] Mali and Niger did not always use the IPCC terminology.

Table 4. Confidence level[a] of emission estimates

Gas and source	Algeria	Argentina	Azerbaijan	Bhutan	Bolivia	Cape Verde	Indonesia	Kazakhstan	Lao People's Democratic Republic	Lebanon	Mauritius	Samoa	Seychelles[f]	Singapore[b]	Turkmenistan[g]	Uruguay	Uzbekistan[h]	Zimbabwe
CO_2																		
Fuel combustion		M	90-91	H M	91	H	H	80-95		H M	H	H	97-99	H M	80-95	H		95
Industrial processes		M	H	H	93					M	H	L				H	89	
Land-use change and forestry		M L		M L	65	L	L		L	M	M	L				M		80-90
CH_4																		
Fuel combustion		M		H M	46	L	H			H M	H	L	97-99		80-95	L		
Fugitive fuel emissions	L	L	50		M		H	40				L			50	L	44	
Livestock		M	78	H	78		M	75	L	M	M	L			75	M	44	
Other agriculture		M	78	L			M			M		L				M		
Waste		M	L		M	L			L		M	L				M	44	80-90
N_2O																		
Fuel combustion		M		H M	M	L	H			H M	H	L	97-99		80-95	M		
Chemical industry		M		H							M	L						
Agricultural soils			50	L	L	L	M			M	M	L				M		

Notes

[a] The secretariat uses the term "confidence levels" in compiling data provided by Parties using different terms: uncertainties, error range, accuracy, etc. Confidence levels are given in percentages. For Parties that reported on uncertainties qualitatively, the following codes were used: high (H); medium (M); low (L).

[b] Kazakhstan reported that errors in the emission estimates for the energy sector are estimated to be 5-20 per cent, except for the residential sector, where errors may exceed 20 per cent. It was further stated that, except for fugitive fuel emissions and CH_4 emissions from livestock, for the rest of the source categories the level of uncertainty varies from 20 to 80 per cent.

[c] Zimbabwe reported that the level of confidence for the commercial use of energy is over 95 per cent, while the accuracy for agriculture, industrial processes, land use, forestry and waste management is between 80 and 90 per cent.

[d] Uzbekistan reported that aggregate estimates of uncertainty by category are ±11% for CO_2 emissions from industrial processes, ±56% for CH_4 emissions from leakage and cattle breeding, ±60% for CH_4 emissions from wastes. A general uncertainty was also calculated as follows for 1994: ±8.6% for CO2, ±42.6% for CH_4, and ±79.5% for N_2O.

[e] Azerbaijan reported high reliability for CO_2 emissions from fuel combustion (9-10%); the average uncertainty for CO_2 emissions from the energy and industrial processes sectors was estimated to be 12%. The uncertainty for CH_4 emissions from waste was estimated to be 100%; this high uncertainty is associated with the lack of accurate data.

[f] Seychelles indicated only that for public electricity, road transportation, aviation and marine bunkers, the uncertainties are small, in the range of 1 to 3%.

[g] Turkmenistan indicated that the level of uncertainty associated with energy activities is estimated to be equal to 5-15%, except for the residential sector where the error range may be up to 20%. The degree of uncertainty for fugitive emissions is equal to 50%. Methane emissions from enteric fermentation in livestock were estimated with 25% error. For other categories, the level of uncertainty varies from 20 to 60%.

[h] Singapore also mentions a medium level of confidence for indirect nitrous oxide emissions from human sewage.

Table 5. Completeness of reporting according to table II of the UNFCCC guidelines

Greenhouse gas source and sink categories	CO_2		CH_4		N_2O	
	Total	%	Total	%	Total	%
Total (net) national emissions (gigagrams per year)	48	**92**	47	**90**	47	**90**
1. All energy	48	**92**	45	**87**	44	**85**
Fuel combustion						
Energy and transformation industries	42 [a]	**81**	33 [a]	63	33 [a, d]	63
Industry	41	79	30	58	24	**46**
Transport	45	**87**	36	69	35 [d]	67
Commercial/institutional	39 [c]	75	28 [c]	54	25 [c, d]	**48**
Residential	43 [b, c]	**83**	34 [b, c]	65	29 [b, c]	56
Other (please specify)	24 [a]	46	15 [a]	29	13 [a, d]	**25**
Biomass burned for energy	20	38	19	37	17	**33**
Fugitive fuel emissions						
Oil and natural gas systems	4	8	27	52	1	2
Coal mining	1	2	20	38	1	2
2. Industrial processes	39	75	16	31	12	23
3. Agriculture	3	6	48	**92**	40	77
Enteric fermentation	1	2	49	**94**	1	2
Rice cultivation	1	2	27	52	1	2
Savannah burning	1	2	19	37	15	**29**
Other (please specify)	2	4	42	**81**	39	75
Manure management			41	78	19	37
Agricultural soils	2	4	1	2	37	71
Field burning of agricultural residues	2	4	31	60	31	60
Other			2	4	1	2
4. Land-use change and forestry	48	**92**	25	48	25	**48**
Changes in forest and other woody biomass stock	43	**83**				
Forest and grassland conversion	35	67	36	69	37	71
Abandonment of managed lands	24 [a]	46				

Table 5 ***(continuation)***

Greenhouse gas source and sink categories	CO_2		CH_4		N_2O	
	Total	%	Total	%	Total	%
5. Other sources as appropriate and to the extent possible (please specify)	22	42	48	**92**	19	37
CO_2 emissions and removals from soils	11	21				
Other (land-use change and forestry)	2	4				
Waste	3	6	46	**88**	18	35
Solid waste disposal on land			46	**88**	3	6
Waste-water handling			38	73	15	29
Waste incineration	3	6	1	2	2	4
Other (waste)			1	2	2	4
International bunkers	28	54	9	17	11	21

Notes

Sectors and source categories that are not requested to be reported as "other" in table H of the UNFCCC guidelines are given in shaded cells.

The values given in bold indicate that the percentage of reporting by non-Annex I Parties is equal to or higher than 80.

[a] Mali and Niger did not always use the IPCC terminology.

[b] Euador presented information only about small scale combustion. In the absence of precise information, we have placed all these emissions in the residential sector.

[c] Israel did not make the distinction between commercial/institutional and residential subsectors. We have considered that both categories have been reported.

[d] Seychelles provided contradictory information.

Table 6. Status of reporting using the IPCC reporting framework

Party	IPCC sectoral information							Comparison with reference approach (CO_2 fuel combustion) [a] Difference (%) [a, j]	
	Sectoral reports	Worksheets [b]					Standard data tables		
		E	IP	A	LUCF	W			
Algeria	X	1-1, 1-2, 1-3, 1-4, 1-7, 1-8	2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-10, 2-11, 2-12, 2-13, 2-15	4-1, 4-4, 4-5	5-1, 5-2, 5-3	6-1, 6-2, 6-3		X	3.37
Argentina	X			4-1 (CH_4)			E and IP	-	-
Armenia	-	-	-	-	-	-	E [c]	X	1
Bhutan	X	-	-	-	-	-	-	-	-
Bolivia	-	1-1, 1-2, 1-3, 1-4, 1-5, 1-8	2-1, 2-2, 2-5, 2-10, 2-12, 2-13, 2-15,	4-1, 4-2, 4-3, 4-4, 4-5	5-1, 5-2, 5-3, 5-4	6-1, 6-2, 6-4	-	X	9.7
Cape Verde	-	1-1 [e]	-	4-1, 4-5	-	-	-	-	-
Chile	-	-	-	-	-	-	-	X	-
Costa Rica	-	-	-	-	-	-	-	X	3.8
Côte d'Ivoire		1-1	2-2, 2-3, 2-5, 2-10, 2-13	4-1, 4-2, 4-3, 4-4	5-1, 5-2, 5-3, 5-4	6-1, 6-2, 6-3	-	-	-
Egypt	-	-	-	-	-	-	E, IP, LUCF, W	X	-
El Salvador								X	6
Ghana [g]	-	1-1 1-3	2-2, 2-3, 2-4, 2-9, 2-11	4-1, 4-2, 4-4, 4-5	5-1, 5-2, 5-3, 5-4	6-1, 6-2, 6-3, 6-4	-	-	-
Honduras	-	1-1, 1-3,	2-1, 2-2, 2-3, 2-4, 2-5	4-1, 4-2, 4-3, 4-4, 4-5	5-1, 5-2, 5-3, 5-4, 5-5	6-1, 6-2, 6-3, 6-4	-	X	- [f]
Indonesia	-	1-1, 1-2, 1-6, 1-7	2-1, 2-2, 2-3, 2-4, 2-6, 2-7, 2-9, 2-10, 2-11	4-1, 4-2, 4-4, 4-5	5-1, 5-2, 5-3, 5-4	6-1	-	-	-
Israel	-	1-1, 1-2, 1-3, 1-4	2-1, 2-2, 2-4, 2-5, 2-6, 2-7, 2-10	4-1, 4-5	5-1	6-1, 6-2, 6-3	-	X	-1.2
Jamaica [h]	-					6-2, 6-3, 6-4	-	-	-

Table 6 ***(continuation)***

Party	IPCC sectoral information							Comparison with reference approach (CO_2 fuel combustion) [a] Difference (%) [c]	
	Sectoral reports	Worksheets [b]					Standard data tables		
		E	IP	A	LUCF	W			
Jordan	-	1-1	-	4-1 (CH_4), 4-3, 4-4	5-1, 5-2, 5-3, 5-4, 5-5	6-1, 6-2, 6-3	E	X	2.4
Kazakhstan	-	-	-	-	-	-	-	X	10
Kiribati	-	1-1	-	4-1	-	6-2	-	-	-
Lebanon	X	1-1, 1-2, 1-3, 1-4	2-1, 2-2, 2-3, 2-4, 2-5, 2-7, 2-8, 2-10, 2-11, 2-12, 2-13, 2-15	4-1, 4-4, 4-5	5-1, 5-2, 5-3	6-1	-	X	-
Lesotho	X	-	-	-	-	-	-	X	-0.16
Mali	-	-	-	4-1, 4-2	-	-	-	-	-
Mauritius	X	1-1, 1-2, 1-3, 1-4, 1-5	2-2, 2-7, 2-13	4-1, 4-5	5-1	6-1	-	X	0
Mexico	-	-	-	-	-	-	-	X	4.9
Philippines	-	-	-	-	-	-	-	X	-5.35
Republic of Moldova	-	-	-	-	-	-	-	X	3.1 (1990) 10.1 (1994)
Senegal	-	1-1, 1-3, 1-5	2-1	4-1 (CH_4), 4-2, 4-3, 4-4	5-1, 5-2, 5-3	6-1, 6-2, 6-3	-	-	-
Seychelles								X	8.5
Singapore	-	1-1, 1-2	-	-	-	6-4	-	-	-
St.Vincent and the Grenadines	-	-	-	-	-	-	-	X	1.6

Table 6 *(continuation)*

Party	IPCC sectoral information							Comparison with reference approach (CO_2 fuel combustion) [a] Difference (%) [e,f]	
	Sectoral reports	Worksheets [b]					Standard data tables		
		E	IP	A	LUCF	W			
Sri Lanka	X	1-1, 1-2, 1-3, 1-4, 1-7, 1-8,	2-1, 2-2, 2-3, 2-4, 2-5, 2-11, 2-12, 2-13, 2-15	4-1, 4-2, 4-4, 4-5	5-1, 5-2, 5-3, 5-4, 5-5	6-1, 6-2, 6-3, 6-4	-	X	5.7 (1994) [d]
Uruguay	X	1-1, 1-2, 1-3, 1-4, 1-5, 1-7, 1-8, 1-9	2-1, 2-2, 2-5, 2-9, 2-12, 2-13	4-1, 4-2, 4-3, 4-4, 4-5	5-1, 5-5	6-1, 6-2, 6-3, 6-4	-	X	6.5 (1990) 1.2 (1994)
Uzbekistan	-	-	-	-	-	-	-	X	4.5
Vanuatu	-	-	-	-	-	-	-	X	2.74
Zimbabwe	-	1-1, 1-3, 1-4	2-1	4-1(CH_4), 4-3 (modified), 4-4	5-1, 5-2, 5-3	6-1, 6-2	-	X	25

Notes:

The following abbreviations have been used: E: Energy; LUCF: Land-use change and forestry; A: Agriculture; IP: Industrial processes; W: Waste.

[a] Comparison of CO_2 emission estimates from *fuel combustion* with those obtained using the IPCC reference approach. Differences as a percentage relative to the estimates obtained using the sectoral approach, which are set at 100 per cent in this table. For Armenia, Bolivia, El Salvador, Israel, Jordan, Lesotho, Mauritius, Mexico, St. Vincent and the Grenadines, Sri Lanka, the Philippines, Uruguay and Zimbabwe, the difference given in this column was calculated by the secretariat based on the numerical data provided in the communications. For Honduras, Kazakhstan, Moldova,the Seychelles, Uzbekistan and Vanuatu, the value given is as reported by the Party.

[b] In some cases, the numeration of worksheets refers to the Revised 1996 IPCC Guidelines, while in others, the numeration refers to the 1995 version of those guidelines. A few Parties also added worksheets which are not part of the IPCC Guidelines.

[c] Standard data table without including values for emission factors.

[d] Emissions from the reference approach were not presented in the national communication (October 2000), but in the national GHG inventory document submitted in November 1999.

[e] The other tables provided by Cape Verde are contained in a separate national GHG inventory officially submitted prior to the initial national communication, but do not exactly correspond to the Revised 1996 IPCC Guidelines.

[f] Incomplete information was provided by Honduras.

[g] Ghana did not provide all the methodological tables for 1990 and 1994; for the one provided the reference year is not always clearly mentioned.

[h] Jamaica provided parts of some methodological tables in the energy sector. As the information provided was only partial, this does not appear as reported.

[i] Grenada indicated that it used the two approaches without providing any detailed comparison or figure.

[j] Turkmenistan provided contradictory information, mentioning that the two approaches were used, but providing values only for the reference approach.

Table 7. Problems encountered and areas for further improvement in respect of activity data (AD), emission factors (EF) and methods (M) by Parties in the preparation of GHG inventories

Party	Problems/ Areas			Comments
	AD	EF	M	
Algeria	X	X		Problems: Lack of specific emission factors (fugitive emissions from natural gas). Difficulties in obtaining or non-availability of activity data for small and medium scale industries. Lack of recent forest inventory. Lack of specific methodology for estimating savannah. Lack of activity data in the waste sector. Improvements: Standardization of data. Development of specific energy emission factors. Undertaking field surveys in the agriculture, LUCF and waste sectors.
Argentina	X	X		Problems: Lack of data for agricultural soils, savannah burning, field burning of agricultural residues, and LUCF. Improvements: Identification of country-specific emission factors (transport). Research into contribution of mining activities to total GHG emissions. Establishment of a statistical system which provides basic information on GHG emitting activities.
Armenia		X	X	Problems: Lack of methodology for estimating emissions from solvent and other product use. Improvements: National CH_4 emission factors for agriculture and waste sectors. Higher degree of precision through introduction of detailed technology-based methodology.
Azerbaijan	X			Problems: Lack of data on the use of soda ash. CH_4 emissions from oil extraction have not been considered. Lack of accurate information and storage conditions of solid domestic waste disposal sites.
Bhutan	X	X		Problems: Non-availability or poor quality of data. Estimates were made for those data not locally available using default IPCC values, which impacted the level of confidence. Emissions from the waste sector were not estimated due to the lack of data for 1994. No proper data available for mining activities relating to limestone and dolomite. Improvements: Rural activity data require immediate attention.
Bolivia	X	X		Problems: Uncertainties about emission factors. Lack of information and field research on N_2O emissions. Improvements: Development of national emission factors for CO_2, based upon the national fuel characteristics. Application of IPCC Guidelines to calculate N_2O emissions.
Cape Verde	X			Problems: Lack of reliable data on woodfuel and biomass. Lack of data on agricultural soils (usage of synthetic fertiliser). Lack of data for estimating NMVOC emissions.
Chile	X		X	Problems: IPCC method for LUCF does not fit national circumstances. Only regional activity data exist for the LUCF, agriculture and waste sectors. Improvements: Development of software for archiving, processing and updating data to prepare the national inventory.
Costa Rica	X			Improvements: Need for a more disaggregated set of data.
Côte d'Ivoire	X	X		Problems: Lack of data on industrial processes and transportation sectors as well as agricultural soils and the use of nitrogen based fertilizers. Improvements: Need for assistance in obtaining precise national data.
Democratic Republic of the Congo	X	X		Problems: Use of some international data. Some forestry data were obtained by extrapolation. Difficulties in distinguishing between domestic commercial wastes from industrial wastes.

Table 7 *(continuation)*

Party	Problems/ Areas			Comments
	AD	EF	M	
Ecuador	X	X		Problems: Lack of an information system which would support the periodic preparation of GHG inventories. Lack of national emission factors and of access to national and global information about methodologies and emission factors.
Egypt	X			Problems: High degree of uncertainty in LUCF. Improvements: Inclusion of more GHGs than the three main ones (CO_2, CH_4, N_2O). Improved reliability and availability of data in LUCF sector. Inclusion of industrial waste-water.
El Salvador	X		X	Problems: Activity data for LUCF not reliable. Method for LUCF was found to be very complex.
Georgia			X	Problems: Problems in considering the LUCF sector.
Ghana	X	X		Problems. The IPCC default emission factors were employed where country data were not available.
Grenada	X	X	X	Problems: Data gaps were identified in: petroleum products, charcoal production, variation in the stock of fuels, marine bunkers and biomass. Lack of relevance of much of the IPCC Guidelines data. Improvements: Initiating appropriate measures to ensure that the information gaps identified are filled with relevant and updated data (need to improve the various existing databases). Assessment of the options for capturing annual production and consumption data of primary fuels. Collaboration with other countries of the region for the development of more accurate emission factors.
Honduras	X			Problems: Lack of information for 1990. Improvements: Elaboration of a new forestry map with more detailed information regarding the different CO_2 sequestration capacities of the different species.
Indonesia	X	X	X	Problems: The magnitude of the net emissions from the forestry sector depends on assumptions used in defining area of logged forest at the growing stage. Improvements: The reliability of activity data and emission factors of the land-use change and forestry sector need to be verified and improved with more measurements.
Israel	X			Problems: Lack of reliable data concerning the use of HFCs, PFCs and SF_6. Improvements: The inventory will be completed when these data are obtained. The national inventory will be updated every three years.
Jamaica	X	X		Problems: Lack of data (fuel wood and charcoal production, asphalt, landing and take-off of aircraft, jet fuel used for domestic flights, frequency and extent of forest fires, waste generation, collection and disposal). Some emission factors are inappropriate (NMVOC from beverage and food, as well as biomass). Improvements: Improved data systems and data gathering. Additional segregation of data for some sectors would allow for more accurate estimates. Establishment of a statistical unit which will collect, monitor and evaluate data from the transport sector. Expanded database that also includes information about wood and yam sticks. Collection of data needs to become a routine in the management of solid waste.

Table 7 *(continuation)*

Party	Problems/ Areas			Comments
	AD	EF	M	
Jordan	X	X		Improvements: Determination of local emission factors for energy production and consumption, industrial processes, agriculture and LUCF. Measurement of emission factors for all identified sectors. Establishment of an environmental monitoring system for air, waste-water, and dust.
Kazakhstan	X			Problems: Activity data could not be gathered in the same way for 1990 and 1994 for fuel combustion source categories, oil and natural gas, industrial processes, forest and grassland conversion, waste-water. Improvements: Application of 1996 IPCC Guidelines and use of new data available. Refinement of fuel combustion source category data for 1994.
Kiribati	X	X		Problems: Only the reference approach was used due to lack of activity data. Default emission factors were also used. Lack of data relating to LUCF and industrial processes precluded filling in the methodological tables for these two sectors. Improvements: Default emission factors need to be replaced by more appropriate subregional and national data.
Lao People's Democratic Republic	X	X		Problems: Assumptions had to be made in the absence of adequate data availability. No specific emission factor. Lack of data on livestock. Growth rates of forest areas are still not available. Lack of information on plantations so they have not been included. Information on waste is based on sample survey of five urban areas. Waste-water generation information is not available, and no systematic collection of data on waste generation.
Lebanon	X	X	X	Problems: Industrial processes: default emission factors may differ for some local industrial processes because of differences in the raw material used. Agriculture: Default emission factors for domestic livestock were not appropriate. Forestry: Use of expert judgements when no data were available. Data availability is not sufficient for the calculation of net carbon fluxes on the basis of changes in soil carbon stocks. Improvements: Forestry: Photogrammetry is an accurate method for future collection of data relating to forest trees and non-forest trees.
Lesotho	X		X	Problems: IPCC Guidelines do not include rampant overgrazing, expansion of croplands into marginal grasslands, and encroachment of settlements onto croplands and rangelands, and emissions caused by sanitation from the rural and peri-urban areas. Weakness of statistics in the energy sector, therefore, projections were made from older surveys. Formidable data problem faced in the waste sector.
Malaysia	X	X	X	Problems: Forestry: Problem collecting data for forest plantation (different formats of databases used by relevant agencies). Problem with the categorization of forest types (different States use different categories) which has possibly affected the accuracy of the results. Differences in terminology definitions (ambiguity in defining afforestation, reforestation, and sink enhancement) also affected the compilation of the inventory. Uncertainty relating to forest fires (natural or human-induced). Improvements: Appropriate local emission factors and more precise definition of the terms used in the forestry sector.
Mali	X	X		Problems: General lack of local emission factors. Lack of data on waste and industrial processes sectors. No statistical data for burning of savannahs. Improvements: Need to organize the national data system according to the requirements of the GHG inventory.

Table 7 ***(continuation)***

Party	Problems/ Areas			Comments
	AD	EF	M	
Marshall Islands	X		X	Problems: CO, NOx and NMVOCs were not included due to a lack of data. International bunkers could not be isolated from national totals. Subjective assessments of animal numbers. No estimates of LUCF. Calculation of N_2O emissions were not provided by IPCC Guidelines for studies using the reference approach. No conversion factors were provided to convert US gallons into kilotons. Methods for calculating CO_2 removals for copra plantation are not provided in the Guidelines. Instructions for dealing with ocean areas as a removal mechanism were not provided in the Guidelines. Improvements: More detailed records of production, sales and replanting over a long period of time will be necessary to determine the value of copra as a sink.
Mauritius	X			Problems: Solvent use. Waste (land disposal). Improvements: Improved statistics to allow for better data gathering and at a higher level of disagregation for periodic GHG inventories. Centralize all climate change related data
Mexico	X			Improvements: Inclusion of solvents and some industrial processes. Establishment of procedures for the annual preparation of the inventory.
Micronesia	X			Problems: Either a lack of data or data quality issues. Except for aggregate fuel data from the energy sector, all other data were derived from estimates. Improvements: Address a number of critical GHG data needs: fuel consumption from "end-use activities" in key sectors such as agriculture, HFCs, PFCs and SF_6 consumption, and carbon dioxide removals, with the aim of improving the collection and maintenance of data sets.
Nauru	X	X		Problems: Limited availability of information. Improvements: Appropriate conversion figures for industrial processes such as phosphate extraction and processing.
Niger	X	X	X	Problems: Constraints relating to data collection. Lack of data: biomass uses (mainly for agricultural residues), industrial processes, forestry and waste sector. Lack of recent national forest inventory. Improvements: Specific assessments on the above-mentioned issues. Training in methodological issues. In-depth training on GHG inventory methodology.
Philippines	X	X	X	Problems: Energy: Problem with the classification of fuels. Industrial processes: Cases where the IPCC Guidelines could not be directly applied. Agriculture: Some data are not available in the format required, e.g. for methane emissions from rice fields. LUCF: Lack of data for the calculation of carbon emissions from soils and abandoned lands.
Republic of Korea	X	X		Problems: Fuel combustion (non-CO_2): IPCC emission factors are not suitable for the available data. To apply IPCC non-CO_2 emission factors requires final energy consumption data by sector and by end-user. Such data are not available. Industrial processes (non-CO_2), agriculture, land-use change and forestry (non-CO_2), waste. Improvements: Inclusion of source categories not covered so far. Modification of methods for collection and processing of inventory data (non-CO_2 for industrial processes, agriculture, land-use change and forestry and waste).

Table 7 *(continuation)*

Party	Problems/ Areas			Comments
	AD	EF	M	
Republic of Moldova	X			Problems: Statistical differences in energy balances. Lack of regional data for small combustion. Incompleteness of data on ferrous and non-ferrous industry. Inaccuracy of domestic solid waste data. Estimation of emissions from the incineration of solid waste was not possible.
Samoa	X			Problems: Lack of quality data and poor data management. Lack of data on biomass (dry matter mass and net calorific value of the various fuel wood types). Due to the unavailability of appropriate information, SO_2 emissions from the energy sector were not reported.
Senegal	X			Problems: Feedstock in the energy sector. Livestock (different methods for gathering of activity data in 1991 and 1994).
Seychelles	X	X		Problems: Energy: Lack of data for CO_2. Insufficient data for N_2O. Industrial processes: Lack of appropriate emission factors. Waste: Lack of local emission factor for waste-water treatment plants. Improvements: Conduct a survey (energy consumption by sector and subsector).
Singapore	X	X	X	Problems: Uncertainties are attributed to inadequate understanding of some of the processes used to estimate GHG emissions, conversion factors and incomplete data.
St Vincent and the Grenadines	X			Problems: Lack of information for the estimation of carbon uptake from non-forest trees. Removals and uptake from forest lands were estimated based on a 1993 forest inventory and long-term land conversion trends. For 1990, 1994 and 1997 the same figures for removals and uptake from forest lands were used.
Sri Lanka	X	X		Problems: Lack of local emission factors. Data for food processing, beverages and tobacco were not available and had to be estimated. Uncertainties in the agriculture, LUCF and waste sectors are due to the use of inappropriate data and default values from the IPCC Guidelines.
Thailand	X	X		Problems: Local emission factors applied are based on limited experiments and case studies and are subject to refinement. For rice cultivation, the uncertainty of these estimates remains high. Lack of reliable activity data (especially for LUCF). Problem of identifying people with the requisite expertise to undertake national GHG inventory work on a regular basis. Improvements: More research and development of local emission factors are needed. Basic research, field observation and testing are needed to improve the quality of data, in order to reduce uncertainties and to enhance understanding of the relationship of these emissions to the productive activities. Need for capacity-building for the staff of relevant agencies in order to update the GHG inventory on a regular basis.
Turkmenistan	X		X	Problems: CO and NO, were not calculated, but taken directly from the national statistical reports. Uncertainty varies from 5 to 60%. Improvements: Studies relating to local emission factors (fuels). Updating modernizing the statistical system and data collection mechanism. Developing the existing GHG inventory database.

Table 7 ***(continuation)***

Party	Problems/ Areas			Comments
	AD	EF	M	
Tuvalu	X			Problems: Lack or unavailability of data in most sectors. Improvements: Sources of emissions from the energy sector not taken into account will be included in the second GHG inventory. Emissions from domestic waste-water is one area that is worth noting for future research work.
Uruguay	X	X	X	Problems: Energy, industrial processes, agriculture, LUCF (non-CO_2), waste (CO_2, N_2O). Improvements: Improvement of the quality, collection and processing of data. Identification of local emission factors.
Uzbekistan	X	X	X	Problems: Energy: Classifications used for the national statistics differ from the IPCC categories (eg: thermal energy). Improvements: Determination of local emission factors, in particular for certain fuel types. Improvement of the existing database of greenhouse gases and of the inventory software.
Vanuatu	X			Problems: Uncertainties and discrepancies in the data are significant. Energy: Fuel wood and charcoal are not included due to inadequate statistics. LUCF: Many forestry-related activities cannot be quantified. Improvements: Refinements of data relating to use of firewood. Burning of forest, shrub and grassland, commercial agriculture, non-commercial forest activities. Conversion of land use, waste, and industry and manufacturing sectors.
Zimbabwe	X		X	Problems: Bunkers, industrial processes, explosives used in mining operations (N_2O), livestock, agricultural soils, savannah burning, abandonment of managed lands and other LUCF source categories, waste (unaccounted dumps). Improvements: More reliable databases to meet the reporting requirements, including building of GHG databases for future national communications, reviewing, updating and systematic dissemination of climate change data, quantitative research into sectoral GHG emissions, and improvement of GHG inventory methods.

Table 8. Improvements introduced in updates[a] of inventories

Party	Improvements
Argentina	1. Inclusion of additional sectors: *land-use change and forestry, agricultural soils, savannah burning, burning of agricultural residues*. 2. Improvements in basic information. 3. CH_4 emissions from *enteric fermentation* and *manure management*: recalculated using the tier 2 IPCC methodology (instead of tier 1). 4. Improvements in reporting: - *Industrial processes*: detailed description of calculation method used. - *Oil and natural gas*: calculations to estimate *fugitive fuel* emissions. - *Agriculture*: worksheet 4-1 provided; description of methodology used to estimate CH_4 emissions from *rice cultivation*. - *Waste*: description of methodology used to estimate CH_4 emissions from *solid waste* and *waste-water* (domestic and industrial). 5. Use of the 1996 IPCC Guidelines.
Bolivia	Inclusion of additional gases: SO_2, HFC. Use of the Revised 1996 IPCC Guidelines. Small combustion: emissions from residential and commercial/institutional sectors were separated. Inclusion of international bunkers.
Chile	Inclusion of industrial processes and solvent use in inventory of year 1994. Setting of the basis needed for preparing a higher quality inventory.
Costa Rica	Inclusion of new gases (SO_2 and HFC) in the 1996 inventory.
Indonesia	Improvement of activity data and emission factors: In 1990, it was reported that Indonesian forest was a net sink. However, with improvement of activity data as well as emission factors, Indonesian forest is becoming a net emitter. But uncertainty remains high.
Israel*	Gases other than CO_2 and CH_4 were included for all sectors; but for industrial processes, CO_2 emissions other than that of cement production were also included. In the energy sector, the technology-based approach was used to calculate CO_2 emissions. Sectoral and summary reports were provided.
Jordan	Improvements in reporting: - Worksheet 5-5 and 5-5A (change in soil carbon for mineral soil) provided. - Inclusion of the source 'agriculturally impacted soils'. - *Fuel combustion* (CH_4 and N_2O): disaggregation of estimates by subsectors (*energy and transformation industries, industry, transport, small combustion*).
Kazakhstan	Refinements of the 1990 inventory were made, e.g. in fuel consumption data.
Mexico	Updates were made regarding: - Energy generation. - *Agriculture* (improved methods to gather the data for CH_4 emissions from livestock). - *Land-use change and forestry* (more precise estimates due to better knowledge of deforestation rates and carbon sequestration from administrated and abandoned lands).
Senegal	*Agriculture* (livestock): improved data collection methods.

Table 8 ***(continuation)***

Party	Improvements
Sri Lanka	Improvements in GHG estimation in agriculture, LUCF and waste sectors. Inclusion of SO_2 emission estimations for industrial processes and fugitive emissions, as well as SF_6 emissions from industrial processes.
Thailand	Previous GHG inventories (1989 and 1990) considered only emissions from energy combustion activities. Some local emission factors have been developed and used for the 1994 national GHG inventory.
Uruguay	1. Use of 1996 IPCC Guidelines. 2. Changes in methodologies: - *Fuel combustion*: new tier 1 method (CO_2 and non-CO_2), new tier 2 for aviation; difference between the sectoral and the reference approach has diminished as a consequence of improvements in methodologies. - *Industrial processes*: new method for calculation of production and use of acetylene gas. - *Agriculture*: modified method to estimate CH_4 from *rice cultivation*. - *Land use change and forestry*: method to estimate change in carbon content in soils used for crops, grassland and pasture. - *Waste*: new classification for disposal sites, new CH_4 correction factor. 3. Changes in activity data: revision of energy balance; availability of data for production, import, export and stock change of lubricants; updated population data available (*waste*).
Zimbabwe	It was stated that with experience gained from the country studies on climate change, the Party is now in a better position to conduct more comprehensive assessments of inventories.

Notes

[a] National GHG inventories prepared and reported for a subsequent year after the submission of a first GHG inventory.

Argentina, Jordan and Uruguay updated the inventories provided in their initial national communications. Sri Lanka updated the information related to years 1993, 1994 and 1995 in the agriculture, LUCF and waste sectors. For Bolivia, Israel [*], Kazakhstan, Mexico, Senegal and Zimbabwe, improvements are in relation to inventories submitted prior to the initial national communications.

Kiribati and Thailand mentioned (in addition to 1994) a national GHG inventory for 1990, but no more information or related tables were given within the national communication.

The Federated States of Micronesia mentioned (in addition to 1994) a 1990 national GHG inventory, but did not provide further details.

[*] Israel did not submit a new national GHG inventory, but completed the first part submitted 3 years ago.

Table 9. Aggregate emissions and removals of CO_2, CH_4 and N_2O in CO_2 equivalent by major source/sink category, including and excluding land-use change and forestry, 1990 (gigagrams and percentage of total by Party)

	Energy		Industrial processes		Agriculture		Other		Total (excluding LUCF)	Land-use change & forestry	Total (including LUCF)	Percentage of LUCF in total GHG
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)	(Gg)	%
1990												
Argentina	106,904.5	45.9	6,310.5	2.7	110,073.2	47.2	9,691.9	4.2	232,984.3	-34,891.0	198,093.3	-15.0
Armenia	23,107.7	91.3	630.3	2.5	1,038.7	4.1	535.5	2.1	25,312.2	-617.0	24,695.2	-2.4
Azerbaijan	52,718.3	86.7	1,444.0	2.4	4,688.7	7.7	1,922.1	3.2	60,784.0	-3,509.0	57,275.0	-5.8
Bolivia	6,619.9	34.1	260.5	1.3	9,631.5	49.7	2,877.0	14.8	19,389.7	50,006.7	69,396.5	257.9
Costa Rica	2,530.3	39.8	367.9	5.8	2,763.7	43.4	699.5	11.0	6,361.5	836.5	7,198.0	13.1
Ecuador	19,892.2	61.8	1,150.0	3.6	8,387.9	26.1	2,748.7	8.5	32,178.8	-7,166.2	25,012.6	-22.3
Egypt	82,415.6	70.7	10,276.0	8.8	17,913.0	15.4	5,691.0	4.9	116,608.6	-9,900.0	106,708.0	-8.5
Georgia	36,130.8	79.1	1,546.2	3.4	4,635.1	10.1	3,377.2	7.4	45,689.4	-1,889.0	43,800.4	-4.1
Ghana	5,146.9	44.5	293.0	2.5	5,315.6	46.0	808.0	7.0	11,562.8	-27,535.0	-15,972.2	-238.1
Indonesia	169,616.6	61.4	14,302.8	5.2	75,101.1	27.2	17,393.9	6.3	276,414.4	188,138.8	464,553.2	68.1
Kazakhstan	245,927.0	91.0	4,349.0	1.6	17,493.0	6.5	2,376.1	0.9	270,145.1	-4,011.0	266,134.1	-1.5
Lao People's Democratic Republic	929.9	13.2	0.0	0.0	5,696.7	80.6	921.5	13.0	7,066.1	-104,985.3	-97,919.2	-1,485.8
Mexico	320,947.4	82.6	11,621.0	3.0	39,462.5	10.2	16,727.0	4.3	388,757.9	135,857.3	524,615.2	34.9
Niger	928.5	19.0	9.6	0.2	3,890.2	79.7	51.8	1.1	4,880.1	6,082.5	10,962.5	124.6
Republic of Korea	248,545.0	85.9	17,617.0	6.1	12,889.0	4.5	10,406.0	3.6	289,457.0	-26,235.0	263,222.0	-9.1
Republic of Moldova	27,149.1	81.6	2,538.4	7.6	2,810.5	8.4	768.0	2.3	33,271.6	-1,849.9	31,421.7	-5.6
Saint Vincent and the Grenadines	81.9	20.8			273.6	69.5	38.5	9.8	394.0	-44.0	350.0	-11.2
Uruguay	3,641.2	13.2	230.0	0.8	22,627.5	81.8	1,155.5	4.2	27,654.1	1,972.4	29,626.5	7.1
Uzbekistan	135,730.0	83.2	6,859.0	4.2	17,428.0	10.7	3,129.0	1.9	163,167.0	-421.0	162,746.0	-0.3
Zimbabwe	19,134.4											
Total	1,508,097.1	75.0	79,805.1	4.0	362,119.4	18.0	81,318.3	4.0	2,012,077.9	159,840.8	2,171,918.7	7.9

Table 9a. Aggregate emissions and removals of CO_2, CH_4 and N_2O in CO_2 equivalent by major source/sink category, including and excluding land-use change and forestry, 1994, 1995 and 1996 (gigagrams and percentage of total by Party)

	Energy		Industrial processes		Agriculture		Other		Total (excluding LUCF)	Land-use change & forestry	Total (including LUCF)	Percentage of LUCF in total GHG
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)	(Gg)	%
1994												
Algeria	70,082.0	75.8	4,768.0	5.2	11,898.0	12.9	5,471.0	5.9	92,508.0	4,330.0	96,838.0	4.7
Argentina	127,125.2	48.1	6,529.9	2.5	115,443.6	43.6	15,382.3	5.8	264,481.0	-34,731.0	229,750.0	-13.1
Azerbaijan	37,312.1	87.3			3,682.6	8.6	1,759.2	4.1	42,748.3	-1,075.0	41,673.3	-2.5
Bhutan	95.8	7.4	133.7	10.3	1,062.9	82.2			1,292.4	-3,549.5	-2,257.1	-274.6
Bolivia	11,820.4	47.7	393.9	1.6	10,811.0	43.6	1,764.4	7.1	24,789.6	29,542.3	54,331.9	119.2
Chile	37,312.2	65.3	2,162.1	3.8	13,156.0	23.0	4,547.7	8.0	57,178.0	-29,709.3	27,468.7	-52.0
Cook Islands	32.6	40.6			10.3	12.9	37.4	46.6	80.3	-154.4	-74.1	-192.3
Cote d'Ivoire	12,438.1	45.9			3,448.9	12.7	11,236.7	41.4	27,123.6	22,246.5	49,370.1	82.0
Democratic Republic of the Congo	3,599.4	7.1	21.9	0.0	34,854.5	68.3	12,547.8	24.6	51,024.5	230,916.2	281,940.7	452.6
El Salvador	4,565.6	38.9	490.1	4.2	5,784.8	49.3	888.8	7.6	11,728.3	3,930.6	15,658.9	33.5
Georgia	6,222.9	57.0	275.0	2.5	2,688.4	24.6	1,724.8	15.8	10,911.1		10,911.1	
Ghana	6,567.8	50.6	281.8	2.2	5,255.7	40.5	878.4	6.8	12,986.0	-14,140.0	-1,154.0	-108.9
Grenada	136.0	8.5			0.4	0.0	1,470.0	91.5	1,606.5	-92.0	1,514.5	-5.7
Indonesia	222,099.8	64.8	19,133.8	5.6	84,507.2	24.7	16,930.2	4.9	342,671.1	155,624.5	498,295.5	45.4
Jamaica	8,231.5	7.1	379.0	0.3	107,233.0	92.1	382.0	0.3	116,429.5	-167.0	116,262.5	-0.1
Jordan	11,843.5	53.8	1,701.0	7.7	561.7	2.6	7,889.7	35.9	21,995.9	-3,548.0	18,447.9	-16.1
Kazakhstan	196,026.8	89.4	1,014.0	0.5	17,388.0	7.9	4,811.1	2.2	219,238.9	-6,627.0	212,611.9	-3.0
Kiribati	18.6	66.3			0.5	1.8	8.9	31.9	28.0		28.0	
Lebanon	11,777.2	75.1	1,924.1	12.3	1,102.1	7.0	904.7	5.8	15,674.5	200.4	15,874.9	1.3
Lesotho	827.2	45.4			938.5	51.6	54.6	3.0	1,820.3	1,260.6	3,080.9	69.2
Malaysia	96,979.2	71.1	4,973.0	3.6	6,932.0	5.1	26,599.5	19.5	136,364.6	-61,081.0	75,283.6	-44.8
Micronesia (Federated States of)	241.0	98.0	0.0	0.0	0.8	0.3	4.2	1.7	246.0		246.0	
Nauru	28.3	78.9			4.9	13.7	2.7	7.4	35.9	-9.1	26.8	-25.2
Philippines	50,040.3	48.3	10,602.9	10.2	33,128.6	32.0	9,742.3	9.4	103,514.1	-2,774.0	100,740.1	-2.7
Republic of Korea	342,746.0											

Table 9a *(continuation)*

	Energy		Industrial processes		Agriculture		Other		Total (excluding LUCF)	Land-use change & forestry	Total (including LUCF)	Percentage of LUCF in total GHG
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)	(Gg)	%
1994												
Republic of Moldova	12,202.4	79.4	689.2	4.5	1,954.2	12.7	511.4	3.3	15,361.4	-1,294.3	14,067.2	-8.4
Saint Vincent and the Grenadines	95.5	25.2			245.3	64.6	40.3	10.6	379.5	-44.0	335.5	-11.6
Samoa	102.8	18.3			430.7	76.6	27.3	4.9	562.2	-82.0	480.2	-14.6
Senegal	3,788.6	38.3	345.5	3.5	2,957.6	29.9	2,804.8	28.3	9,896.4	-6,575.5	3,320.9	-66.4
Singapore	26,647.9	99.2					211.2	0.8	26,859.1		26,859.1	
Sri Lanka	6,751.1	22.9	300.6	1.0	11,924.2	40.5	10,455.1	35.5	29,441.6	27,884.6	57,326.1	94.7
Thailand	129,867.7	57.6	15,976.9	7.1	77,393.3	34.3	2,117.7	0.9	225,368.2	21,374.2	246,742.3	9.5
Turkmenistan	48,916.5	93.5	840.1	1.6	2,334.0	4.5	219.0	0.4	52,309.5	380.6	52,690.1	0.7
Tuvalu	4.7	83.6			0.9	16.4			5.6		5.6	
Uruguay	3,970.8	13.3	279.1	0.9	24,277.1	81.4	1,288.2	4.3	29,815.2	-865.2	28,950.0	-2.9
Uzbekistan	127,854.0	83.1	4,942.0	3.2	17,837.0	11.6	3,255.0	2.1	153,888.0	-399.0	153,489.0	-0.3
Vanuatu	64.2	21.5			235.2	78.5			299.4	-1.2	298.2	-0.4
Zimbabwe	16,758.9	60.7	4,592.5	16.6	5,714.5	20.7	557.7	2.0	27,623.7	-62,269.0	-34,645.3	-225.4
Total	1,635,194.7	76.8	82,750.2	3.9	605,198.6	28.4	146,525.9	6.9	2,128,285.9	268,502.9	2,396,788.8	12.6
1995												
Cape Verde	219.8	72.7			39.4	13.0	42.9	14.2	302.2	27.4	329.6	9.1
Honduras	3,985.1	28.9	514.8	3.7	3,381.2	24.5	6,226.1	45.2	13,786.3	1,348.1	15,134.4	9.8
Mali	968.4	9.9	9.6	0.1	7,572.7	77.7	1,196.3	12.3	9,746.8	16,588.8	26,335.6	170.2
Mauritius	1,760.0	85.4	88.1	4.3	139.3	6.8	71.5	3.5	2,060.4	-221.4	1,839.0	-10.7
Seychelles	179.6	70.0			27.5	10.7	49.4	19.2	256.4	-832.8	-576.4	-324.8
Total	7,112.8	27.2	612.4	2.3	11,160.0	42.7	7,586.1	29.0	26,152.1	16,910.1	43,062.2	64.7
1996												
Israel	50,598.4	80.2	2,425.3	3.8	2,071.5	3.3	7,980.0	12.6	63,097.2	-190.0	62,907.2	-0.3

Table 10: Areas of reporting on possible abatement options from non-Annex I Parties

Energy	Agriculture	Forestry	Waste
ARG, ARM, AZE, BOL, BTN CHL, CIV, COK, CPV, CRI, DZA ECU, EGY, FSM, GEO, GHA GRD, HND, IDN, ISR, JOR, KAZ KIR, KOR, LAO, LBN, LKA, LSO MDA, MEX, MHL, MLI, MUS MYS, NER, NRU, PHL, SEN, SGP SLV, SYC, THA, TKM, TUV URY, UZB, VCT, VUT, ZWE	ARG, AZE, BOL, CHL, CIV, COK CPV, CRI, DZA, ECU, EGY, GEO HND, IDN, ISR, KAZ, KOR, LAO LKA, MDA, MLI, MUS, NER PHL, SLV, SYC, THA, TKM TUV, URY, UZB, ZWE	ARG, ARM, AZE, BOL, CHL, CIV COK, CPV, CRI, DZA, ECU, EGY FSM, GEO, GHA, GRD, HND IDN, JOR, KAZ, KIR, KOR, LBN LKA, LSO, MDA, MEX, MHL MLI, MUS, MYS, NER, NRU PHL, SGP, SLV, SYC, THA, TKM TUV, URY, UZB, VCT, VUT ZWE	ARG, ARM, AZE, COK, CRI, EGY GEO, GRD, IDN, ISR, JOR, KAZ KOR, LBN, MDA, MEX, MUS NRU, SGP, SLV, SYC, THA, TKM TUV, URY, UZB, WSM

Table 11. Areas of ongoing or planned research programmes reported on climate change impacts, vulnerability assessment and adaptation options

Adaptation and vulnerability areas	Socio-economic areas	Environment	Biodiversity	Forestry	Agriculture	Livestock	Fisheries	Water resources	Coastal zones	Human health	Cross-cutting issues
Climate change impacts/ vulnerability assessments	DZA KOR MEX MUS URY	ARG BOL EGY HND MDA MEX MLI MUS SEN SYC URY WSM	AZE FSM ISR MDA SYC VCT WSM	AZE, BOL CIV, CPV CRI, DZA FSM, HND IDN, ISR LKA, MDA SYC, THA TUV URY	AZE, BOL BTN, CIV CPV, CRI DZA, EGY FSM, GRD ISR, KAZ LKA, LSO MLI, MUS PHL, SYC THA, TKM VUT, URY UZB, ZWE	BTN BOL CPV DZA MUS	AZE ECU ISR SYC TUV URY	ARM, AZE BOL, BTN CPV, DZA EGY, FSM GHA, GRD HND, ISR JOR, KAZ LKA, MLI MUS, PHL SEN, SLV THA, TUV URY, UZB VUT	AZE, EGY FSM, HND IDN, ISR LKA, MUS MHL, PHL SEN, SYC THA, TUV URY, VUT WSM	BOL DZA ECU GRD ISR LKA MUS PHL SYC THA URY	ARM, ECU EGY, FSM GFO, ISR KOR, LKA MEX, MHL MUS, PHL SEN, SYC THA, URY UZB, VUT ZWE
Adaptation options	BTN DZA WSM	ARM BTN MLI NRU ZWE	ARM ISR MLI	BOL, BTN CPV, CRI DZA, GRD, IDN ISR, KOR LKA, NER, THA WSM ZWE	BOL, BTN COD, COK CPV, CRI DZA, EGY GHA, GRD HND, IDN ISR, JAM JOR, KAZ LKA, LSO MLI, MUS NER, PHL THA, URY VUT, ZWE	BOL CPV DZA NER URY ZWE	ISR	ARM, BOL COD, COK CPV, DZA ECU, GRD HND, ISR JAM, KAZ LKA, MDA MLI, NER PHL, SLV SYC, THA TKM, URY VUT	BTN, COK ECU, FSM GHA, HND ISR, JAM MUS, PHL THA, TUV URY	BOL DZA ECU ISR LKA PHL THA URY ZWE	ARM, EGY FSM, IDN ISR, LKA SEN, SLV UZB, VCT

Table 12. National networks of observation stations relating to systematic observation

Meteorological stations	Climate stations	Synoptic stations	Rain gauges	Hydrological stations (lake, river, etc.)	Oceanographic stations[27]	Upper-air observing stations	Lightning detectors	Seismic stations	Aeronautical stations	Radar stations	Satellite stations	GHG monitoring stations	Other stations not specified
ARM, AZE, BOL BTN, CIV, COD CRI, ECU, GEO GHA, ISR, JAM KOR, LKA, LSO MLI, MUS, NER PHL, THA, UZB ZWE	ARM CRI ECU GRD JAM KAZ LSO MHL VCT	COK GHA JAM KOR LSO PHL	COD ECU GHA GRD JAM LSO MLI NER ZWE	ARM AZE BOL ECU GHA GRD JAM MLI NER UZB	AZE, CHL COK, CRI ECU, GHA GRD, JAM KOR, MHL MUS, NRU TUV, UZB VCT	COK KOR JAM PHL	KOR	KOR	GHA KOR JAM MUS	COK GEO GHA JAM KOR ZWE	CIV ECU KOR MLI MUS UZB ZWE	ARG ISR KOR	ARG, CHL, COK, ECU ISR, KAZ KOR, LSO MEX, MUS PHL, URY

Table 13. National needs relating to systematic observation

Maps	Databank	Statistics	Research
ARM, COD, GHA JAM, MHL, VCT	ARG, BOL, BTN, CHL, CIV ECU, GHA, GRD, HND, ISR JAM, KAZ, LAO, LKA, LSO MHL, MLI, MUS, NER, URY UZB, VCT, ZWE	ARM, ECU, GHA LAO, LKA, TKM	ARG, ARM, COD, CRI, GHA HND, ISR, JAM, KAZ KOR, LKA, MEX, MUS, SEY TKM, URY

[27] Due to the diverse terminology used by reporting Parties, the current usage of the term oceanographic stations includes marine stations, and tide stations gauges.

Table 14. Regional and international cooperation for systematic observation

Country	Regional	International
Argentina	- Regional network for observation of greenhouse gases including ozone and UV-B radiation - in cooperation with Uruguay and Paraguay installation of stations in the "Southern Cone" region. - Regional data bank on meteorological and environmental data.	- Global observation of greenhouse gases including ozone: working in cooperation with International Atomic Energy Agency, Max Planck Institute (Germany) and Comparative Institute for Research in Environmental Sciences (CIRES) (France). - Participation in global networks and "cooperative projects" under the World Meteorological Organization (WMO). - Financial assistance from the European Union for research into river hydrology and on the development of climate numerical models.
Armenia	- Interstate Council of the Commonwealth of Independent States on Hydrometeorology.	- Committed to cooperate with world and regional centres and national hydrometeorological services in the field of information exchange. - Part of the observations are provided to WMO for publication. - Participation in global networks and "cooperative projects" under WMO, in particular assistance by Meteo France to access RETIM-AEROMET system, which enables meteorological data and maps to be received from the geostationary satellites - and CLICOM system of climatic data reception and service. - Provision of observations to world centres of information on climate (Germany and Japan) for use in general circulation models.
Bolivia		- El SENAMHI, is in charge of the hydrological and meteorological monitoring network, and is also part of WMO.
Cape Verde	- Interstate committee to combat drought in the Sahel (CILSS).	- Collaboration with FAO, International Fund for Agricultural Development (IFAD), World Food Programme (WFP), WMO, GEF, UNDP, United Nations Office to Combat Desertification and Drought (UNSO), United Nations Children's Fund (UNICEF), UNESCO, Holland and Luxembourg
Chile	- Working group constituted as part of the action plan for the protection of the sea and coastal areas in the south-east Pacific.	- Participation in the Joint Global Ocean Flux System, as part of the International Geosphere-Biosphere Programme. - Collaboration between the National Environmental Commission and the Meteorological and Hydrological Institute of Sweden, to address regional pollution problems and climate variability.
Cook Islands		- Supports regional and international organizations such as WMO.
Costa Rica	- Regional Agreement about Climate Change, subscribed to by the Central American countries. - Member of the Inter-American Institute for Global Change (IAI).	
Côte d'Ivoire	- Collaboration with PRESAO (West Africa Seasonal Forcast)	
Democratic Republic of the Congo	- Participation in the Regional Programme on Environmental Information Management	- Use of FAO information. - Funded by FAO for Tropical Forestery Action Programme. - UNDP funds for Environment National Action Plan.

Table 14 ***(continuation)***

Country	Regional	International
Ecuador	- Programme on the monitoring of Andean Glaciers, developed by the French Institute for Research and Development (IRD) with country teams in Bolivia, Ecuador and Peru. In Ecuador in collaboration with National Institute of Hydrology and Meteorology (INAMHI) and National Polytechnical School (Escuela Politecnica Nacional)	
Ghana	- "Building Capacity in Sub-Saharan Africa to respond to UNFCCC" Project, with GEF/UNDP support.	- Remote sensing application unit is a programme supported by DANIDA/UNDP in order to develop land use information, spatial data, environmental remote sensing and sea level data.
Grenada	- Participation in Caribbean planning for adaptation to climate change. - Prospect of participation in the development of CC scenarios in Caribbean (XVI).	
Honduras	- Urgent need to continue monitoring meteorological variables, in order to verify whether those measures implemented to reduce GHG emissions have had any effect on the planet.	
Israel	- Several bilateral agreements for environmental cooperation have been signed. - Cooperation through MASHAV (the centre of international cooperation), especially in desertification and afforestation.	- International activities are carried out within the framework of international and regional organizations, especially UNEP.
Jamaica	- Participation in Caribbean planning for adaptation to climate change. - Support from South Pacific Regional Environment Programme (SPREP). - Member of Caribbean Meteorological Organization. - Regional approach for similar information gaps on climate change.	- Member of WMO. - Support from National Communications Support Programme.
Kazakhstan		- Participation in global networks and "cooperative projects" under WMO, including World Climate Programme (WCP). - Assistance from UNEP and WMO for climate change monitoring. - Assistance from the United States Country Studies Program for preparing climate change scenarios using GCM.
Mali	- Participation in the Agrhymet Programme. - Member of CILSS.	- Collaboration with the Research Centre for Agrobiology in the Netherlands. - Collaboration with WMO and FAO. - UNDP/GEF capacity-building project.
Marshall Islands	- The country participates in the PICCAP (Pacific Islands Climate Change Assistance Programme) in relation to mitigation options and also in the JREP (Joint Regional Energy Programme) / SOPAC/SPC.	
Mauritius		- Participation in international activities of WMO, UNEP and IPCC. - Financial assistance from the United States Country Studies Program for use of aerial video-tape-assisted vulnerability analysis.

Table 14 ***(continuation)***

Country	Regional	International
Mexico	- Regional collaboration involving the Inter-American Institute for Global Change Research, including training courses.	
Niger	- Regional project for capacity-building in systematic observation. - Permanent Interstate Committee for Drought Control in the Sahel (CILSS). - Regional project for CC adaptation and land management in the Sahel.	- Participation in the IPCC meetings. - Capacity-building on climate change impact on agriculture in Africa (World Bank initiative). - WMO publication: Climate forecast in Africa.
Republic of Korea	- Observation and analysis of Asian monsoon and global water cycles. - Korean-Chinese meteorological cooperation agreement in 1994 for technological cooperation on telecommunication systems and Global Air Watch. - Korean-Japanese Science and Technology Committee - development of weather forecast system for the Korean Peninsula. - Meteorological cooperation with Australia.	- Participation in the Global Environment Monitoring System managed by UNEP and WHO. - Participation in global networks and "cooperative projects" under the WMO, in particular the Global Air Watch, the Global Climate Observing System and the World Climate Programme. - Participation in the Global Ocean Observing System coordinated by the Intergovernmental Oceanographic Commission of UNESCO. - Participation in the Global Energy and Water Cycle Experiment. - Participation in Global Change and Terrestrial Ecosystems Project, Land Use and Land Cover Change, Atmospheric Model Intercomparison Project, Paleo-climate Modelling Intercomparison Project, Coupled Models Intercomparison Project, START-TEACOM.[a]
St Vincent and the Grenadines	- A sea level climate monitor was installed along the south-west coast of St Vincent near the coastguard station on December 4, 1998. This monitoring system is part of SVG's involvement in Component 1 of the CPACC's (Caribbean Planning for Adaptation to Climate Change) regional initiative.	
Uruguay	- Regional research within the Inter-American Institute for Global Change Research (IAI).	- Participation in global networks and "cooperative projects" under WMO, including Global Air Watch, Global Climate Observing System, World Weather Watch. - Financial assistance from the European Union for research on river hydrology and on the development of climate numerical models.
Seychelles	- Regional network of sea level monitoring stations.	- Participation in WMO, UNEP, Intergovernmental Panel on Climate Change. - Financial assistance from the GEF and technical assistance provided by the National Communications Support Programme.
Turkmenistan	- Not specified.	- Participation in WMO, UNEP and UNDP programmes.
Zimbabwe	- Hosts the Southern African Development Community (SADC) Regional Drought Monitoring Centre in cooperation with the SADC Early Warning System for Food Security.	

Note:

[a] START-TEACOM: Global Change System for Analysis, Research and Training Regional Research Committee for Temperate East Asia.

Table 15. Difficulties encountered or requirements to be met to enable improved reporting of systematic observations

Country	Difficulties encountered or needs to be met to improve reporting
Armenia	- Absence of required funding leads to the conduct of irregular observations on a limited scale; the system of collectio n, processing and transfer of observations is stated to be outdated. - Sharp reduction in scientific research on hydrometeorology and climatology.
Bolivia	- Limitation in the infrastructure relating to the hydro-meteorological network. The actual monitoring network of hydro logy and meteorology does not cover the whole country. - Lack of exchange of information between the different actors involved in the process of investigation.
Bhutan	- Upgrading/improvement of meteorological organization/infrastructure on climate change issues. - Upgrading/integration into line of ministerial organizations of Central Statistical Organization and training in database dev elopment.
Cape Verde	- The need to adapt climatic numeric models was reported. - Setting up of an information collection system.
Cook Islands	- Information gaps relating to early storm surge warnings, early cyclone warnings, lack of data collection, identif ication of mechanisms for cost-effective transfer of data. - Capacity-building needs relating to training and equipment, and data transfer systems.
Côte d'Ivoire	- Difficulties in obtaining climate change data. - Institutional capacity-building needs.
Democratic Republic of the Congo	- Systematic observation was not reported. However, some hydrological data need to be collected.
Ecuador	- Development of specific measurements for climate, glaciers and oceanographic data. - Development of a climate database. - Improvement of the equipment of the present meteorological and hydrological network. - Better understanding of the ENSO process. - Implementation of an information system on climate change.
Egypt	- The National Authority for Remote Sensing and Space Science identified needs relating to up-to-date hardware and software, capacity-building in the modelling and prediction, development of a database on climate patterns. - The meteorological authority identified research in priority areas including the Global Climate Observing System, the Global Terrestrial Observing System and the Global Oceanographic Observing System. - Capacity-building needs also include training of staff on use of satellite monitoring equipment and networking with national and international universities and WMO.
Ghana	- The need to update or replace existing equipment to enhance the computerization process. - The need to train professional staff in order to increase their number and replace people who will be retiring. - Lack of efficient telecommunications systems to serve the synoptic stations. - The need for equipment replacement and installation of new equipment at the Hydrological and Meteorological Services Departments and Water Resources Institute. - The need to train staff to operate the equipment and analyse data and results.

Table 15 ***(continuation)***

Country	Difficulties encountered or needs to be met to improve reporting
Grenada	- Need for good long records of stream flows. - Training and external assistance for an improved water resources assessment and monitoring programme. - Expansion of the rainwater collection system. - Training need for simulation models. - Collection and analysis of relevant data. - Strengthening of systematic monitoring and observation systems. - Strengthening of technical capacity. - Strengthening of data collection and monitoring systems.
Honduras	- Need to set a monitoring network for sea level. Lack of trained personnel in data collection.
Israel	- Limited information for preparation of adequate adaptation measures. - Additional information is especially needed in the area of ecosystem response to climate change. - Inadequacy of global-scale models to predict impacts on Israel's territory due to climate change.
Jamaica	- Need for continuous ongoing climate change research as well as medium and long-term models. Boost weather observing capability. - Need for the development of regional climate models at the scale of small islands (water resources, effects of saline intrusion on the water supply, storm surge modelling, creation of hazard maps). - Need for additional technical expertise, additional equipment (high speed computers and other specialized technical equipment). - Collection of more baseline data.
Lao People's Democratic Republic	- National institutions not well equipped to analyse the data needed for climate change activities. - Need for capacity-building in collecting climate change data.
Lebanon	- Although there is no section on systematic observation, a section on bioclimatic zones identifies needs for the rehabilitation of the climatic station network, an increase in the number of such stations, especially in remote areas and in mountain ranges, continuous monitoring of the records leading to their updating and the creation of a data bank, and the acquisition of specific software for processing such data and their transcription into digitized maps.
Lesotho	- Lack of trained personnel, lack of finance, improvement of facilities and equipment.
Mali	- Data collection needs on a continuous basis. - Development of a geographic information system. - Setting up of a national data collection network. - Technical assistance and training for climate change analysis tools.
Marshall Islands	- Due to the serious lack of essential background information there is no opportunity for the government of the RMI to document the variability in the natural systems of the atolls or the reef islands. - Inadequate baseline information from which to measure change and assess impacts. - Another information deficiency is the uncertainty in the position of mean sea level across and between the atolls and islands of the Republic. - Creation of information management systems and applied research assistance for the selection of representative atolls and islands from which to measure climate-induced changes.
Mauritius	- Proper data organization, and need for training.
Micronesia (Federated States of)	- Need to have up-to-date maps showing detailed topography, also identified is the need for climate baseline monitoring stations using specific islands as reference sites.

Table 15 ***(continuation)***

Country	Difficulties encountered or needs to be met to improve reporting
Niger	- No section on systematic observation. Some needs and projects for climate data collection and capacity-building in systematic observation.
Philippines	- Need for expansion and upgrading of network of stations.
St.Vincent and the Grenadines	- The climate-monitoring stations established under CPACC are a significant contribution in this regard, but better tracking of air and water quality and a change-detection system are necessary.
Seychelles	- Only two tide gauges are in operation in the island group.
Sri Lanka	- The available data have not been sufficiently collected and analysed. This has to be done as a matter of priority. At the same time the data gaps have to be identified early and steps taken to fill the gaps. - The need to increase awareness of climate change among relevant stakeholders and policy makers. The need to provide financial and technical support through research, training and communication of information.
Thailand	- Additional resources are needed to enhance the technical capability of local researchers. Cooperative efforts between countries in the region are also important to support such development. - Local climate data are important for development of local climate scenarios for impact assessment. Local climate data are also required for the development of regional and subregional climate scenarios. - Lack of sufficient spatial and historical local climate data can hinder the development of climate scenarios in Thailand.
Turkmenistan	- Need to work on the elaboration of methods and statistical interpretation of global climate models.
Uzbekistan	- Insufficient funding has led to a reduction in the number of monitoring posts and makes upkeep of equipment at the stations difficult; there are no automatic meteorological stations. - Current monitoring network does not meet the requirements of the World Climate Programme. - Currently the databases on meteorology, hydrology, aerology, glaciers, snow cover in mountains, air pollution and hydrochemistry are poorly connected to each other both in terms of methodology and in terms of software; these databases should be updated and improved to facilitate access to information on the climate system. - Need for development of a database containing all the available information. - Current improvements in monitoring of hydrometeorological network are directed at automation of monitoring through the use of computing equipment and new data processing software, and improvement in the quality of monitoring and in communication of the data to those who need it.
Zimbabwe	- Need for data to be continuously reviewed, updated and systematically disseminated.

Table 16. Methods used by Parties for climate change impacts and vulnerability assessment

Method	ARG	ARM	AZE	BOL	BTN	CHL	CIV	COD	COK	CPV	CRI	DZA	ECU	EGY	FSM	GEO	GHA	GRD	HND	ISR	JAM	KAZ	KIR	KOR
Scenarios																								
GCM equilibrium	✓		✓	✓		✓	✓					✓	✓	✓			✓		✓		✓	✓	✓	✓
GCM transient			✓	✓				✓	✓						✓		✓			✓	✓	✓		
SCENGEN technique				✓		✓		✓	✓		✓	✓			✓		✓	✓			✓		✓	
SCM (MAGICC)											✓	✓					✓		✓		✓			
Incremental	✓	✓	✓											✓		✓						✓		✓
Analogue, statistical		✓				✓								✓		✓						✓		
Socio-economic		✓														✓						✓	✓	
IPCC ASLR	✓					✓			✓					✓	✓								✓	
Not specified	✓				✓					✓														
Other	✓										✓													✓
Agriculture																								
DSSAT 3/IBSNAT and CERES	✓										✓	✓	✓	✓			✓					✓		
Livestock: SPUR2																								
National models		✓				✓					✓	✓				✓						✓		✓
Qualitative					✓			✓	✓	✓								✓			✓		✓	
Other				✓							✓													
Not specified			✓		✓										✓	✓								
Water resources																								
CLIRUN											✓													
National models	✓	✓	✓			✓				✓				✓		✓				✓	✓	✓		
Qualitative					✓			✓	✓					✓				✓			✓		✓	
Other							✓	✓				✓					✓							
Not specified				✓						✓			✓		✓				✓		✓	✓		✓
Coastal zones and marine ecosystems																								
Common IPCC methodology including economic analysis	✓					✓		✓	✓				✓	✓	✓								✓	
Qualitative							✓	✓	✓	✓								✓			✓		✓	
Other											✓			✓		✓	✓			✓				
Not specified			✓																✓					✓

Table 16 ***(continuation)***

Method	ARG	ARM	AZE	BOL	BTN	CHL	CIV	COD	COK	CPV	CRI	DZA	ECU	EGY	FSM	GEO	GHA	GRD	HND	ISR	JAM	KAZ	KIR	KOR
Terrestrial ecosystems																								
Holdrige or GAP				✓						✓			✓											
National methods		✓				✓																		
Qualitative				✓	✓					✓		✓												
Other										✓														
Not specified	✓		✓									✓				✓					✓	✓		✓
Human health																								
Statistical approach				✓																				
Qualitative	✓	✓					✓		✓					✓				✓					✓	
Not specified																								
Other sectors [28]																								
Qualitative	✓	✓		✓		✓			✓					✓	✓	✓							✓	✓
Other			✓											✓										✓
Not specified												✓												
Integrated analysis																								
Qualitative												✓											✓	
Not specified																✓								
Quantitative methods														✓										
Consistency with IPCC technical guidelines on vulnerability and adaptation (as reported by Parties)			✓						✓					✓	✓							✓	✓	

[28] Includes fisheries, energy, industry, human settlements.

Table 16 ***(continuation)***

Method	LBN	LKA	LSO	MEX	MHL	MLI	MDA	MUS	NER	NRU	PHL	SEN	SYC	SLV	THA	TKM	TUV	URY	UZB	VCT	VUT	WSM	ZWE
Scenarios																							
GCM equilibrium		✓	✓	✓	✓		✓	✓		✓	✓	✓				✓		✓	✓		✓		✓
GCM transient	✓	✓	✓				✓		✓					✓	✓	✓	✓					✓	
SCENGEN technique							✓	✓	✓	✓				✓							✓	✓	
SCM (MAGICC)																							
Incremental				✓			✓	✓			✓	✓		✓		✓		✓					
Analogue, statistical				✓			✓	✓						✓		✓	✓		✓			✓	
Socioeconomic	✓		✓				✓	✓	✓	✓		✓		✓		✓	✓					✓	
IPCC_ASLR						✓	✓	✓	✓	✓				✓		✓	✓	✓			✓		
Not specified													✓										
Other																				✓			
Agriculture																							
DSSAT 3/IBSNAT and CERES			✓	✓		✓					✓	✓			✓			✓					✓
Livestock_SPUR2																		✓					
National models														✓					✓				
Qualitative										✓													
Other						✓					✓							✓		✓			
Not specified	✓	✓			✓		✓	✓	✓							✓	✓					✓	
Water resources																							
CLIRUN																✓							✓
National models				✓					✓		✓								✓				
Qualitative	✓					✓				✓											✓		
Other				✓		✓			✓						✓					✓			
Not specified		✓			✓		✓	✓					✓			✓	✓					✓	
Coastal zones and marine ecosystems																							
Common IPCC methodology incl. economic analysis								✓			✓	✓		✓ ✓		✓	✓	✓			✓	✓	
Qualitative										✓													
Other				✓				✓			✓	✓						✓		✓			
Not specified	✓	✓			✓								✓		✓								

Table 16 *(continuation)*

Method	LBN	LKA	LSO	MEX	MHL	MLI	MDA	MUS	NER	NRU	PHL	SEN	SYC	SLV	THA	TKM	TUV	URY	UZB	VCT	VUT	WSM	ZWE
Terrestrial ecosystems							✓																
Holdrige or GAP			both	✓											✓								✓
National methods				✓															✓				
Qualitative	✓										✓											✓	
Not specified		✓					✓	✓	✓				✓										
Other																				✓			
Human health																							
Statistical approach											✓				✓								
Qualitative			✓					✓		✓							✓				✓		✓
Not specified	✓	✓			✓				✓														
Other sectors [29]																							
Qualitative	✓			✓				✓		✓	✓	✓					✓				✓	✓	
Other														✓			✓						
Not specified	✓		✓						✓														
Integrated analysis																							
Qualitative											✓							✓				✓	
Not specified																							
Quantitative methods				✓										✓									
Consistency with IPCC technical guideline on vulnerability and adaptation (as reported by Parties)	✓		✓	✓			✓	✓		✓	✓			✓			✓		✓		✓	✓	✓

Note: "Qualitative" means an approach that includes expert assessments and qualitative assessments of possible impacts of sea level rise

[29] Includes fisheries, energy, industry, human settlements.

Table 17. Summary of the results of impacts and vulnerability assessment by Parties by sector

Country	Sector							Assistance
	Agriculture and food security	Water resources	Coastal zones and marine ecosystems	Terrestrial ecosystems (forest, rangelands, etc.)	Human health	Fisheries	Other	
Algeria	+	+		+	- q		- q energy and industry	GEF
Argentina	+	+	- q	- q	- q		- Recreation area - energy	USCSP, GEF
Armenia				- grasslands	- q		- q mountains - wildlife - fresh water systems	GEF
Azerbaijan	+			- grasslands + forest			- land and agroclimatic resources	GEF
Bolivia	+	+		+				USCSP, GEF, Netherlands Climate Studies Assistance Programme
Bhutan	+	- q		- q	- q		- glacial outburst	GEF/UNDP/NCSP/Tata Energy
Cape Verde	-	-	- q	- q			- tourism, human settlement	GEF
Chile	+	+	- q	+ grasslands, forest				GEF
Cook Islands	- q	- q			- q		- q biodiversity	GEF
Costa Rica	+	+		+				GEF, Netherlands Climate Studies Assistance Programme
Côte d'Ivoire		- q	- q	- q				GEF
Democratic Republic of the Congo	- q	- q	- q					GEF
Ecuador	+							GEF, Netherlands Climate Studies Assistance Programme
Egypt	+				- q	- q	- industry, human settlements, wetlands	USCSP, GEF
El Salvador	-	-	-				- q human settlements	USCSP
Georgia	-	-	- q	+ forest			- q ecosystems	GEF
Grenada	- q	- q	- q		- q	- q covered in agriculture sector	- tourism	GEF/USCSP
Ghana	-	-	-					UNDP/GEF, Netherlands Climate Studies Assistance Programme

Table 17 *(continuation)*

Country	Sector							Assistance
	Agriculture and food security	Water resources	Coastal zones and marine ecosystems	Terrestrial ecosystems (forest, rangelands, etc.)	Human health	Fisheries	Other	
Honduras		± q	-				- q due to more frequency in extreme events (hurricanes)	GEF
Israel	- q	± q	- q	- q	- q	- q	- q deterioration of the ecotone	Israel Ministry of Environment
Jamaica	- q	- q	- q					GEF
Kazakhstan	± - livestock	±		- grasslands				USCSP
Kiribati	- q	- q	-		- q	- q		USCSP
Lebanon	± q	- q	- q	- q	- q	- q		GEF
Lesotho	- crop - livestock	-		- forest, rangelands	- q		+ q culture ± q biodiversity	GEF
Mali	-	- q						GEF/Enda
Marshall Islands	- q	- q	- q		- q	- q		GEF, PICCAP
Mauritius	±	- q	-	± q	- q	- q		GEF
Mexico	-	± nm	-	- forest			- human settlements	USCSP, GEF
Micronesia (Federated States of)	- q	- q	- q		- q	- q	- q wildlife	USCSP, GEF
Moldova	± q	± q		- forest			- soils	GEF/UNDP/NCSP
Nauru	- slr.q		- q		- q		- biodiversity	GEF
Niger	- q - livestock	- q		-	-			GEF
Republic of Korea	±	±	-	± forest		- q		No
Philippines	- ±	±	- slr ± mangrove	- q	-			USCSP, GEF
Samoa	- q	- q	-	- q	- q		- biodiversity	USCSP, GEF
Senegal	- q		-	- q			- industry, human settlements	GEF
St.Vincent and the Grenadines	- q	- q	- q	- q	- q	- q		GEF
Seychelles	q	- q	- q	- q	- q	- q	- impacts of climatic extremes	GEF/UNDP/NCSP
Sri Lanka	- q	- q	- q	- q	- q	- q		USCSP, GEF

Table 17 ***(continuation)***

Country	Sector							Assistance
	Agriculture and food security	Water resources	Coastal zones and marine ecosystems	Terrestrial ecosystems (forest, rangelands, etc.)	Human health	Fisheries	Other	
Thailand	±	-	- q	+	- q			GEF
Turkmenistan	- q	- q					Aral Sea	GEF/UNDP/NCSP
Tuvalu	± q	- q	-		- q			GEF
Uruguay	±		-			- q		USCSP, GEF
Uzbekistan	+	+		- grassland			Aral Sea	GEF
Vanuatu	- q	- q	-		- q	+		GEF
Zimbabwe	+	- nm		- forest	- q			USCSP, GEF

Notes: The meanings of plus and minus signs are as follows:

- in the agricultural sector, grasslands and forestry: a decrease in crop yield or biomass.
in the water resources sector: a decrease in runoff.
in the coastal zone and marine ecosystems, health sector and fisheries: general negative impact.

+ in the agricultural sector, grasslands and forestry: an increase in crop yield or biomass.
in the water resources sector: an increase in runoff.
in the coastal zone and marine ecosystems, health sector and fisheries: general positive impact.

± means in the agricultural sector, grasslands and forestry: an increase and decrease in yield or biomass depending on the type of crop, scenarios used or area of country/region; in the water resources sector: an increase and decrease in runoff depending on scenario or study areas; in the coastal zone and marine ecosystems, health sector and fisheries: mixed impact.

q means results presented qualitatively.

Table 18. Adaptation assessment and adaptation evaluation methods by Parties by sector

Country	Agriculture and food security	Water resources	Coastal zones and marine ecosystems	Terrestrial ecosystems (forest, rangelands, etc.)	Human health	Other	Reporting
Algeria	✓	✓			✓	✓ energy, industry	List of options
Argentina	✓				✓	✓ energy	List of needs and options
Armenia	✓	✓		✓	✓	✓ freshwater systems	Initial adaptation analysis. List of options
Azerbaijan	✓ CCB	✓	✓ CCB	✓			Initial adaptation analysis. List of options with initial cost estimation
Bolivia	✓	✓		✓	✓		List of options
Bhutan	✓	✓		✓	✓	- Glacial outburst	List of options
Cape Verde	✓			✓			General adaptation analysis
Chile	✓ CB						Initial adaptation analysis. List of options, with initial cost estimation
Cook Islands			✓		✓		List of needs
Costa Rica	✓	✓	✓	✓			
Côte d'Ivoire		✓	✓	✓			List of options
Democratic Republic of the Congo	✓ Livestock	✓	✓				List of options
Ecuador	✓	✓	✓	✓			Initial adaptation anlysis. List of options and list of adaptation projects
Egypt	DSSAT ASF	✓	✓ ASF ADM			✓ Freshwater systems/ fisheries	Adaptation analysis. Ranked options
El Salvador	✓	✓					Adaptation analysis. List of options
Georgia	✓	✓	✓	✓			Initial adaptation analysis. List of options
Ghana	✓	✓	✓				List of options
Grenada	✓	✓	✓ Tourism				List of options
Honduras	✓	✓	✓	✓		✓ extreme events	List of options
Indonesia	✓	✓	✓	✓			List of options
Israel	✓	✓	✓	✓	✓		Preliminary analysis options
Jamaica	✓	✓	✓				List of options
Jordan		✓					Identification of priority actions and preliminary cost estimates
Kazakhstan	✓ ADM	✓ CB					Adaptation analysis. Ranked options
Kiribati	✓	✓	✓				List of options. Cross-sectoral adaptations
Lao People's Democratic Republic							No V&A studies
Lebanon	✓	✓	✓	✓	✓	✓ fisheries	Initial adaptation analysis List of options. Cross-sectoral adaptations
Lesotho	✓	✓		✓	✓		Initial adaptation analysis. List of options. Cross-sectoral needs for adaptation
Mali	✓	✓					List of options

Table 18 *(continuation)*

Country	Agriculture and food security	Water resources	Coastal zones and marine ecosystems	Terrestrial ecosystems (forest, rangelands, etc.)	Human health	Other	Reporting
Marshall Islands	✓	✓	✓		✓		List of options
Mauritius	✓	✓	✓	✓			Initial adaptation analysis. List of options
Mexico	✓						Some measures mentioned as needs
Micronesia (FSM)	✓	✓	✓ CB			✓ fisheries	Initial adaptation analysis. List of options
Moldova	✓	✓		✓		Soils	List of options
Nauru							General statement on the needs for adaptation
Niger	✓ Livestock	✓		✓	✓		List of options
Republic of Korea		✓	✓	✓			List of options
Philippines	✓ ADM	✓ ADM	✓				Adaptation analysis. Ranked adaptation options
Samoa	✓ ASE	✓ ASE	✓ ASE	✓	✓		Adaptation analysis. Ranked adaptation options
Senegal							No adaptation option mentioned. Project on adaptation analysis in progress
St Vincent and the Grenadines	✓	✓	✓	✓			List of options
Seychelles	✓	✓	✓	✓	✓	✓ fisheries	List of options and projects
Sri Lanka	✓	✓	✓	✓	✓		List of options
Thailand	✓	✓	✓	✓	✓		List of options
Turkmenistan	✓	✓				coastal zones, Aral Sea	List of options
Tuvalu							General statement on the needs for adaptation
Uruguay	✓ CB		✓ ASE ADM				Adaptation analysis. Ranked adaptations
Uzbekistan	✓	✓		✓		✓ Aral Sea	Initial adaptation analysis. List of options
Vanuatu	✓	✓	✓		✓		List of options
Zimbabwe	✓	✓ CCB		✓			Adaptation analysis. Ranked adaptations

Notes:
CCB – cost and cost-benefit analysis
ASE – Adaptation Strategy Evaluator
ADM – Adaptation Decision Matrix
DSSAT – Decision Support System for Agrotechnology Transfer

Table 19. Summary of adaptation options in the agricultural, water resources and coastal zone sectors

Option/sector	ARG	ARM	AZE	BOL	BTN	CHL	CIV	COD	CPV	CRI	DZA	ECU	EGY	FSM	GEO	GHA	GRD	HND	IDN	ISR	JAM	JOR	KAZ	KIR
Agriculture																								
Educational and outreach activities to change management practices to those suited to climate change	✓	✓	✓					✓		✓			✓		✓	✓		✓		✓	✓		✓	✓
Switch to different cultivars		✓	✓			✓							✓	✓	✓	✓		✓	✓		✓		✓	✓
Improve and conserve soils	✓			✓	✓			✓	✓		✓			✓	✓		✓			✓	✓		✓	
Enhance irrigation efficiency and or expand irrigation	✓	✓	✓	✓				✓	✓		✓	✓	✓				✓	✓	✓	✓	✓			
Agriculture research and interactive transfer of technology				✓														✓					✓	
Establish seed banks								✓															✓	
Develop new crops		✓			✓				✓		✓	✓	✓			✓				✓	✓		✓	
Develop and introduce policy measures, including taxes, subsidies, facilitation of free market								✓									✓				✓		✓	
Develop early warning system and disaster preparedness																					✓			
Improve pest and disease forecast and control					✓			✓	✓			✓			✓						✓			
Water resources																								
Increase water supply, e.g. by using groundwater, building water storage reservoirs, improving or stabilizing watershed management, desalination		✓	✓	✓			✓	✓	✓		✓		✓	✓	✓	✓	✓				✓		✓	
Decrease water demand, e.g. by increasing efficiency, reducing water losses, water recycling, changing irrigation practices		✓	✓	✓			✓		✓				✓		✓	✓			✓	✓	✓	✓	✓	✓
Develop and introduce flood and drought monitoring and control system		✓		✓							✓		✓		✓						✓	✓		
Reduce water pollution		✓		✓			✓	✓					✓					✓	✓		✓	✓		

Table 19 ***(continuation)***

Option/sector	ARG	ARM	AZE	BOL	BIN	CHL	CIV	COD	CPV	CRI	DZA	ECU	EGY	FSM	GEO	GHA	GRD	HND	IDN	ISR	JAM	JOR	KAZ	KIR
Improve or develop water management		✓	✓	✓	✓		✓		✓	✓	✓			✓		✓	✓	✓	✓	✓	✓			✓
Alter system operating rules, e.g. pricing policies, legislation				✓										✓							✓			
Coastal zones and marine ecosystems																								
Develop integrated coastal zone management										✓			✓			✓		✓			✓			✓
Develop planning/new investment requirements							✓				✓	✓	✓				✓	✓		✓	✓			
Protect, including building sea walls, and beach nourishment			✓				✓	✓		✓			✓	✓		✓		✓	✓	✓	✓			✓
Retreat			✓					✓					✓	✓	✓						✓			
Research/monitor the coastal ecosystems										✓	✓	✓		✓	✓			✓		✓	✓			✓

Table 19 *(continuation)*

Option/sector	KOR	LBN	LKA	LSO	MEX	MHL	MLI	MDA	MUS	NER	NRU	PHL	SEN	SYC	SLV	THA	TKM	TUV	URY	UZB	VCT	VUT	WSM	ZWE
Agriculture																								
Educational and outreach activities to change management practices to those suited to climate change		✓	✓	✓				✓	✓	✓		✓			✓	✓			✓		✓		✓	✓
Switch to different cultivars				✓		✓						✓		✓	✓	✓			✓			✓	✓	✓
Improve and conserve soils		✓		✓			✓					✓		✓	✓		✓		✓	✓		✓		✓
Enhance irrigation efficiency and/or expand irrigation		✓	✓	✓				✓	✓			✓					✓		✓	✓		✓		
Agriculture research and interactive transfer of technology																	✓		✓					
Establish seed banks																			✓		✓			
Develop new crops		✓	✓	✓		✓				✓		✓		✓	✓	✓								✓
Develop and introduce policy measures, including taxes, subsidies, facilitation of free market		✓		✓						✓		✓		✓	✓									
Develop early warning system and disaster preparedness				✓						✓		✓		✓	✓									✓
Improve pest and disease forecast and control										✓									✓					
Water resources																								
Increase water supply, e.g. by using groundwater, building water storage reservoirs, improving or stabilizing watershed management, desalination	✓	✓	✓			✓		✓	✓	✓		✓		✓	✓		✓			✓	✓	✓	✓	✓
Decrease water demand, e.g. by increasing efficiency, reducing water losses, water recycling, changing irrigation practices	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓	✓	✓	✓			✓		✓		✓
Develop and introduce flood and drought monitoring and control system	✓			✓			✓					✓					✓							✓

Table 19 *(continuation)*

Option/sector	KOR	LBN	LKA	LSO	MEX	MHL	MLI	MDA	MUS	NER	NRU	PHL	SEN	SYC	SLV	THA	TKM	TUV	URY	UZB	VCT	VUT	WSM	ZWE
Reduce water pollution		✓		✓								✓									✓			
Improve or develop water management	✓	✓		✓						✓		✓		✓	✓	✓	✓					✓		✓
Alter system operating rules, e.g. pricing policies, legislation	✓	✓		✓			✓	✓	✓			✓				✓						✓		
Coastal zones and marine ecosystems																								
Develop integrated coastal zone management		✓	✓								✓	✓				✓			✓		✓	✓	✓	
Develop planning new investment requirements		✓	✓			✓					✓	✓				✓			✓			✓	✓	
Protect, including building sea walls, and beach nourishment		✓	✓			✓	✓	✓	✓		✓	✓							✓				✓	
Retreat	✓	✓									✓										✓			
Research/monitor the coastal ecosystems		✓					✓	✓	✓		✓	✓							✓			✓	✓	

Table 20. Public awareness activities and materials

AREAS	Pamphlets and brochures	Newsletters	Articles and publications	Information kits	Teaching materials	Posters	Expositions	CD-ROMS	Internet	Audiovisual material	Radio	Television	Public talks/ open lectures	Others
Climate change	ARM AZE CRI FSM IDN ISR JAM NER NRU TUV URY UZB	AZE GEO LSO MDA MLI TKM UZB	ARM AZE BOL CRI GEO NER TKM UZB ZWE	COD CPV ECU GHA MHL MLI NER THA	BOL COD CPV FSM GHA GRD ISR LKA MLI NRU URY VCT	PHL TUV	PHL THA URY		GEO THA ZWE	GHA GRD JAM	ARM AZE CIV COD GHA GRD MLI NER NRU TUV UZB VCT	ARM AZE CIV COD GHA GRD MLI NRU TKM UZB VCT	ARM COD GRD ISR LKA LSO MEX MUS NRU PHL THA URY	ECU GHA HND MDA MHL THA TKM
Environment	CRI ISR MUS NER THA	KOR MUS THA	CRI EGY MUS NER	COD CPV MUS NER THA	COD CPV GHA ISR LKA MUS		ISR	MUS	MUS THA	GHA MUS THA	COD CIV EGY GHA MUS NER THA	COD CIV EGY GHA MUS THA	CIV COD CRI ISR LKA MUS TKM URY ZWE	GHA HND MHL SYC THA
Energy	CRI ISR JOR KOR		CRI KOR	MLI	CRI GRD ISR MDA MLI		CRI ISR KOR		THA	KOR GRD THA	ISR GRD THA	GRD ISR JOR KOR THA	COD CRI GRD ISR KOR	GHA HND MHL THA

BEN Party reported on public awareness regarding V&A, education communities (p. 45) without any indication of the material used.
LAO Party reported on increasing public awareness (p. 37) as well as a programme to increase the awareness of benefits of 4-stroke engine (p. 58) and a wider dissemination of climate change information to the younger generation (p. 60).

Table 21. Needs for financial assistance to identify and/or implement measures for addressing climate change

Needs	Agriculture	Energy	Forestry	Waste management	Industry	Transportation	Cross-cutting issues
Research	COD, IDN, MUS, THA	COD, ECU, ISR, KIR, MLI, UZB, VCT	COD, ECU, MUS	COD, ECU	COD, MUS	ARG, COD, EGY, MUS, VCT	COD, FSM, PHL, SEN, SEY, URY
Education and training	CPV, GRD, IDN, MDA, NER	CPV, GRD, IDN, LBN, MDA, MHL, MUS, NER, PHL, SLV	CPV, GRD, IDN, MDA, NER	EGY, GRD, MUS, NER	GRD, NER, ZWE	GRD, MUS	COD, GHA, IDN, JOR, PHL, SEY, URY
Strategy and planning development	ARG, KAZ, LAO, MEX, MUS	CPV, GRD, LAO, TKM	ARG, BOL, CPV, GRD, KAZ, LAO, MEX, MHL, MUS	EGY, GRD, LAO	JOR, KAZ, LAO	ARG, LAO, MHL	ARM, AZE, FSM, JOR, KAZ, LAO, LSO, PHL, SEY, URY, VUT, WSM
Institutional capacity	CIV, GRD, LAO	CIV, CPV, GRD, JOR, LAO, LBN, SLV	CIV, CPV, GRD, LAO	CIV, EGY, GRD, LAO	CIV, GRD, LAO	CIV, GRD, LAO	BOL, CIV, JOR, LAO, LBN, PHL, SEY, SLV, URY
Resources management		CPV	ARG, BOL, CPV, KAZ				
Access to information	BTN, CPV, ECU, GRD, LAO	BTN, CPV, ECU, GRD, LAO, UZB	BTN, LAO, ECU, GRD	BTN, GRD, LAO	BTN, GRD, LAO	ARG, BTN, GRD, LAO	BTN, GRD, LAO
Decision-makers' awareness-raising and training	HND, LAO	LAO, LBN, VCT	LAO	LAO	JOR, LAO, ZWE	LAO	LAO, LBN
Infrastructure and technology	GRD, HND	BTN, CIV, CPV, EGY, GRD, LAO, MUS, PHL, URY, UZB, ZWE	GRD, HND	GRD	GRD, LBN, URY	CRI, GRD, LAO, MUS	CPV, FSM, GHA, KAZ, PHL, URY
Efficiency		BOL, BTN, GRD, JAM, JOR, MHL, THA, TKM, VCT			BOL	CIV, MUS	
Project preparation	MLI	BTN, CPV, GRD, JAM, LAO, MLI	MLI	MLI	MLI	MLI	ECU, IDN, MEX, MLI, URY
Stakeholder participation	CIV, GRD, NER	CIV, GRD, JOR, MUS, NER, SLV	CIV, GRD, IDN, NER	CIV, EGY, GRD, NER	CIV, GRD, NER	CIV, GRD	CIV
Other not specified	BOL, CRI, HND, ISR, MDA	CRI, MDA	CRI	CRI	CRI	BOL, URY	SEY